DEPARTMENT OF DEFENSE APPROPRIATIONS FOR 1952

WEDNESDAY, AUGUST 1, 1951

UNITED STATES SENATE,
SUBCOMMITTEE OF THE COMMITTEE ON APPROPRIATIONS,
Washington, D. C.

The subcommittee met at 10 a. m., pursuant to recess, in room 224 of the Senate Office Building, Hon. Joseph C. O'Mahoney (chairman of the subcommittee) presiding.

Present: Senators O'Mahoney, McKellar, Hayden, Maybank, McClellan, Ferguson, Bridges, Knowland, Young, and Thye.

DEPARTMENT OF THE ARMY

FINANCE SERVICE, ARMY

STATEMENTS OF COL. L. N. SMITH, ASSISTANT CHIEF OF FINANCE; COL. V. M. BUDGE, CHIEF, FINANCE ESTIMATES DIVISION, OCF; W. K. MENEFEE, ASSOCIATE CHIEF, FINANCE ESTIMATES DIVISION, OCF; MAJ. GEN. G. H. DECKER, CHIEF, BUDGET DIVISION, OCA; LT. COL. J. F. SKELLS, MANPOWER CONTROL DIVISION, AC OF S, G–1; COL. JOHN E. PERMAN, MANPOWER CONTROL DIVISION, AC/S, G–1; AND BRIG. GEN. R. S. MOORE, SPECIAL ASSISTANT TO THE ASSISTANT SECRETARY OF DEFENSE, COMPTROLLER

1952 BUDGET ESTIMATES

Senator O'MAHONEY. The subcommittee will be in order.

Colonel Smith will be the witness this morning. We will be glad to have your statement, Colonel.

Colonel SMITH. Mr. Chairman and gentlemen: The fiscal year 1952 estimates for "Finance service, Army," total $3,610,848,000. Of this amount, $3,308,425,000 is for pay of the Army, $254,000,000 for travel of the Army, and $48,423,000 for finance service.

The estimates for 1952 represent an increase of approximately 36 percent, or $951,000,000, over 1951 appropriations. The 36-percent increase in the 1952 request as compared to 1951 appropriations is directly attributed to the 41-percent increase in the average troop strength to be paid, trained, deployed, and serviced in 1952.

MILITARY STRENGTH

Funds appropriated in 1951 provided for Army expansion from 593,000 troops on July 1, 1950, to a projected 1,552,000 on June 30,

1951, for an average pay strength of 1,089,374. The 1952 troop program provides for a beginning and ending strength of 1,552,000 for an average pay strength of 1,531,200, or an increase of approximately 442,000 over 1951. Comparison of the strengths by identity is:

	Man-years		
	Fiscal year 1951	Fiscal year 1952	Increase 1952 over 1951
Commissioned officers	89,172	120,600	+31,428
Warrant officers	7,925	14,700	+6,775
Army nurses and Women's Medical Specialist Corps	5,296	8,300	+3,004
Enlisted personnel	984,647	1,385,200	+400,553
Cadets, USMA	2,334	2,400	+66
Total (man-years)	1,089,374	1,531,200	+441,826

Senator O'MAHONEY. Colonel, these were averages?

Colonel SMITH. Yes.

Senator O'MAHONEY. What was the total enlisted strength of the Army on the 30th of June, 1951?

Mr. MENEFEE. The enlisted strength on June 30, 1951, was 1,399,362 enlisted personnel. However, this is not an audited strength.

Senator O'MAHONEY. What was the adjective you used before the word "strength"?

Mr. MENEFEE. It is not an "audited" strength; it is a preliminary figure.

Senator O'MAHONEY. A preliminary figure?

Mr. MENEFEE. Yes.

Senator O'MAHONEY. And the figure, again, is what?

Mr. MENEFEE. 1,399,362 enlisted personnel on June 30.

Senator O'MAHONEY. And how many officers?

Mr. MENEFEE. For the commissioned officers, 114,601. I do not have a consolidated figure for all categories of officers, but can give them to you individually.

Senator O'MAHONEY. As of June 30, you have approximately reached the average strength which you intend to have for 1952, less than 200,000 below the average of 1,531,200?

Mr. MENEFEE. And the nurses and the warrant officers have a separate figure, which I can give you if you care to have them.

Senator O'MAHONEY. I think it might be well to have that statement in the record for all of these categories.

Very well, Colonel, you may proceed.

(The information referred to is as follows:)

Army command strength as of June 30, 1951

Commissioned officers	114,601
Warrant officers	9,855
Nurses and Women's Medical Specialist Corps	5,906
Enlisted personnel	1,399,362
Cadets, United States Military Academy	1,872
Total	1,531,596

PAY OF THE ARMY

Colonel SMITH. Both the 1951 and 1952 estimates provide for an 18 division force with supporting troops.

A project breakdown of the subappropriation for "Pay of the Army" is shown on page 100 of the justifications.

Of the $3,308,425,000 requested for this subappropriation, approximately 97.5 percent is required for military pay and related items, and 2.5 percent for civilian pay.

MILITARY PAY

The $3,224,000,000 requested for military pay represents the application of statutory pay rates to troop strength.

CIVILIAN PAY

The major part of the $82,100,000 civilian requirement in Pay of the Army, is for civilian employees of military headquarters other than the departmental offices; 16 percent of the requirements falls into the administrative areas of the Secretary of the Army, Adjutant General, Judge Advocate General, and others; 43 percent in the Army Areas; and 41 percent in oversea commands. Major areas of increase are in the latter two categories. The Army Area requirement provides for headquarters staffing of 3 new and 26 other installations scheduled for expansion in 1952, in addition to a full year requirement for the 23 new and 38 expanded installations which were staffed on a phased basis in 1951. In general, the 1952 oversea requirement is a projection of current year usage, except in certain areas where additional requirements exist due to increases in troop strength or assigned missions.

MILITARY ADMINISTRATIVE PERSONNEL FOR COMBAT UNITS

Senator HAYDEN. Mr. Chairman.

There has been some criticism by the Armed Services Committee that enlisted and commissioned personnel has been employed which might well be in combat units. Has any consideration been given to that criticism in the build-up of this pay item?

General DECKER. Yes, sir, there has been, and we have undertaken a rather extensive program in the Army to replace military personnel by civilians wherever that could be done, in order to release more military personnel for combat units.

In addition to that, we have organized a panel of senior officers at Army Field Force Headquarters, which is making a study of the military structure itself, in order to cut down on the personnel employed on some of the administrative and supply functions in order that more combat units can be formed within the existing strength of the Army. We are pushing that very aggressively, Senator.

Senator HAYDEN. Does that require an increase in the number of civilian personnel? In other words, is it an actual reduction in the total number of persons, civilian and military, that will be employed, or is it a substitution of civilian personnel for military?

SUBSTITUTION OF CIVILIAN FOR MILITARY EMPLOYEES

General DECKER. In part, it is a substitution of civilians for military, and will require more civilian personnel.

Senator HAYDEN. I have no objection to that, and I think that by and large, it costs the Government less to employ civilians to do certain kinds of work here, than it does to use somebody in the military service, considering the pay and subsistence and clothing and other allowances, and then the benefits that accrue subsequently to the man's discharge, and all of that ought to be taken into consideration in determining whether a civilian or a soldier should do the work.

Senator O'MAHONEY. Are you referring to commissioned personnel, Senator Hayden?

Senator HAYDEN. Undoubtedly there are places where commissioned personnel could be displaced by civilians.

Senator O'MAHONEY. Have you gone into that, General Decker?

General DECKER. Yes. The same comment applies to both commissioned and enlisted personnel; certain functions can be performed by civilians in lieu of the officer or enlisted man.

Senator O'MAHONEY. What are those functions?

General DECKER. Mostly in the supply, repair and utilities, and administrative fields; for instance, in my own budget division, a good civilian analyst is probably more valuable in that kind of work than an officer would be, because civilians stay with it longer and acquire a background of experience in it. However, I also use military personnel; either military or civilian can be used.

Senator O'MAHONEY. How many officers are in your division?

General DECKER. I have 30 officers authorized, sir.

Senator O'MAHONEY. How many of those would you be willing to displace by civilians, General Decker?

General DECKER. I have actually changed slightly the ratio of officers to civilians on my staff since the fighting in Korea began, by taking on additional civilians and not additional officers. I could probably displace several of my officers with competent civilians if I could find them; of course, there is always the problem of finding competent civilians to do the work.

Senator O'MAHONEY. And I suppose those men who could be displaced would prefer to serve with troops?

General DECKER. I think most officers would prefer service in the field, to service in the Pentagon.

TRAVEL OF THE ARMY

Colonel SMITH. Travel of the Army is set out in summary form on page 124 of the Justifications. The 1952 request totals $254,000,000. Eighty-eight percent of the estimate is for permanent change of station travel of individuals and units, including transportation and organizational equipment; 7 percent for temporary duty travel; and 5 percent for school travel where permanent change of station is not authorized.

While it is the policy of the Department to hold travel to an absolute minimum consistent with its many responsibilities, it is pointed out that considerable redeployment of forces is planned for 1952 which, combined with travel and transportation costs incident to the induction, training, and deployment contemplated in the expanded 1952 troop program, will generate a substantial increase in permanent change of station travel over the current year level.

TRAVEL PLANNING

Senator O'MAHONEY. Who has charge of the planning of travel? You merely do the paying?

Colonel SMITH. We do the paying, yes, sir.

Senator O'MAHONEY. There frequently have been incidents of apparent cross-currents of travel, soldiers and officers being sent from one end of the country to the other, and then finding that they have to retrace their steps. Who supervises that?

General DECKER. Insofar as the movement of units is concerned, that would emanate from the Assistant Chief of Staff, G–3, who supervises all operations and training. Insofar as individuals are concerned, the movements would be dependent on the policies established by the Assistant Chief of Staff, G–1, who is in charge of personnel affairs.

For instance, the tour of duty overseas, which involves travel, would be governed by the policy established by the Assistant Chief of Staff, G–1, and approved by the Chief of Staff and the Secretary of the Army.

Senator O'MAHONEY. That is not precisely what I am driving at, General Decker. I am wondering if there is anybody in the Army whose duty it is to prevent, if possible, this duplication of travel, of sending men back and forth across the country?

General DECKER. Well, that is a matter of good administration.

Senator O'MAHONEY. It is a matter of assignment of troops.

Now, is there anybody in the division which has charge of the assignment of troops, whose duty it is to supervise such duplication, because that is an apparent source of excessive travel pay?

General DECKER. Well, it would be the responsibility of the Assistant Chief of Staff, G–3, to keep those troop movements to a minimum; certainly we do not want to shuttle troops around the country any more than is necessary; it would be G–3's responsibility.

Senator O'MAHONEY. Would you advise G–3 that we would like to have a statement with respect to the administrative set-up which has been created for the purpose of eliminating unnecessary travel? And that includes individuals.

(The information referred to is as follows:)

CONTROL OF TRAVEL

1. All orders which involve payment for travel are required to state the purpose for which such travel is required.

2. Individual travel is controlled by the Assistant Chief of Staff, G–1. Under this control, travel orders are issued with the following stipulations:

a. Travel of officers and warrant officers.

(1) All agencies requesting the Department of the Army to issue permanent change-of-station orders will state in detail the reasons for the necessity of the movement of each officer.

(2) Except for cogent reasons, permanent change of station will not be requested for the following:

(*a*) Those officers on extended active duty who have less than 1 year to serve.

(*b*) Those officers who are within 2 years of reaching the mandatory age for retirement.

(*c*) All officers who have not completed a minimum of 2 years' duty at their current station.

(*d*) Those officers assigned to stabilized activities who have not completed the minimum prescribed period of stabilization.

(3) Exceptions to the requirements in (1) above are authorized in the case of those officers ordered—

(*a*) For separation.

(*b*) By commanding generals of hospitals to their homes awaiting retirement.

(*c*) To and returning from oversea assignments.

(*d*) To and from service schools and civilian institutions as students.

(*e*) To civilian component duty.

(*f*) To a new station for compassionate reasons when a position is thereat vacant which can effectively employ the abilities of the individual transferred.

b. Travel orders of enlisted men.

(1) All agencies authorized to issue travel orders for enlisted personnel will exercise the strictest economy in the issuance of travel orders. Each case will be reviewed to substantiate the necessity for the move and to see that the move, if necessary, is executed in the most economical manner.

(2) Every effort will be made to reassign personnel, where reassignment is required, to duty at stations which will involve the least amount of travel.

(3) Reassignments which involve travel should not ordinarily be made on enlisted personnel who are within 1 year of completing an enlistment.

(4) Reassignments solely for the convenience of the individual involving permanent change of station will not be made. Compassionate transfers may be made only in cases where a position vacancy at the new station is available which can utilize the abilities of the individual transferred.

3. Blanket travel orders, those authorizing an individual to perform repeated travel either from a specified or within a specified geographical limit, are authorized only in the following cases:

a. When specifically approved by the Vice or Deputy Chief of Staff (or the Administrative Assistant to the Secretary of the Army in case of employees of the Office of the Secretary of the Army). Such approvals are based upon necessary supporting data.

b. Travel by the Chief of Staff, the Secretary of the General Staff, and the Chief of the Army Field Forces.

c. Train inspectors, not to exceed 30, under the Provost Marshal General, on whom blanket orders for periods of 30 days, extended as required for similar periods, may be issued.

d. Couriers in cases determined by The Adjutant General.

e. Instructors at USMA, as determined by the Superintendent, USMA, to make repeated travel to New York City for the purpose of attending courses of study at various universities in that city. Such blanket orders may be issued and extended for 30-day increments as deemed desirable by the Superintendent.

4. The Assistant Chief of Staff, G–1, may approve exceptions to the above general policies when the facts of the situation so warrant. However, such exceptions are small in number and in frequency.

5. All of these policies are designed to limit travel to a minimum preventing, particularly, the issuance of orders sending a man from one part of the country and back again. At times this is necessary when specialized schooling must be given to individuals from many units geographically located away from the school station. However, the Assistant Chief of Staff, G–1, the Adjutant General, and commanders who have the authority to issue travel orders conduct a careful scrutiny of this matter. Other causes that necessitate seemingly unwarranted travel at times are those incident to carrying on the police action in Korea. Opening up new stations requires that specialist personnel be obtained by a levy on as wide an area of selection as possible in order not to destroy the effectiveness of any existing units. Secondly, personnel in any particular unit must be selected from as wide an area as possible in order that casualties in that unit will not all be from one section of the country. Thirdly, replacement requirements may come in from the Far East Command entirely unexpectedly. In order to satisfy these needs for specialist personnel it may well happen that the most available men have just completed travel to a destination in the zone of interior for another purpose. Replacement and filler needs are controlled by the Assistant Chief of Staff, G–1, with these factors in mind.

6. Control of unit travel is monitored by the Assistant Chief of Staff, G–3, in coordination with the Assistant Chief of Staff, G–4. The principal device used to exercise this control is the troop program which prescribes in advance the planned locations of units. This insures that no movement of units is initiated without considerable prior planning as to purpose, facilities to house and support the unit at its destination, and coordination with the over-all plans for the training, organization, and development of the Army. Since the Korean police action

began first priority has been given to meeting the needs of the Far East Command. At times it has been found necessary to abandon the planned use of particular units, required as a matter of necessity, in Korea.

7. Movement of units is monitored by the Assistant Chief of Staff, G–3, worldwide. The following are typical examples of reasons why units are moved from one area to another:

a. *Antiaircraft artillery.*—These units can be trained only at Fort Bliss, Camp Edwards, and Camp Stewart. Upon completion of this training these units are moved to stations based on operational requirements. In the case of those Reserve component units inducted into the active Army, it can be readily understood that a unit from, for example, the State of Washington, could quite possibly train at Fort Bliss and then return to the vicinity of its home State. This has proven to be more economical than opening new stations or expanding present stations to permit antiaircraft artillery firing.

b. Maneuvers.—Rather than limit the size of a maneuver to those units in the immediate vicinity of a maneuver area, past experience has shown that large-scale field exercises are decidedly superior in readying units for combat. No one Army area has sufficient units in the type and quantity necessary for proper execution of the maneuver, necessitating a large amount of unit travel to and from the selected area.

c. Housing.—In some cases, due primarily to the expansion of the Army in increments and to obviate the necessity for opening a new station, it has been necessary to move units from one station to another, thereby creating room for a large unit within the capacity of existing facilities.

d. Movement of units to overseas theaters is based on operational requirements. There have been isolated instances in which units have gotten as far as the port of embarkation, only to find that for unforeseen circumstances the requirement no longer existed for their shipment. They are then moved to another station, possibly that from which they had just departed.

e. In reviewing a request for unit movement G–3 has always considered, as one of its guiding principles, the cost involved.

INCREASED TRAVEL ACTIVITIES

Senator THYE. Mr. Chairman, what is the percent of travel expense in this proposed budget in comparison with travel expense in previous military appropriations? Is it running about the same percent?

It seems rather high to me. Your travel expense seems rather high in percent to your over-all appropriations or budget request here, and for that reason I was wondering whether your percent of your budget for travel was in line with what it had been in previous years.

Mr. MENEFEE. There are two factors that enter into that. One is the constant increase in the cost of travel. For example, I might cite that in May we had a 15-percent increase in pullman fares; and the Joint Travel Regulations which came out in April, based on the Career Compensation Act of 1949, tended to place enlisted travel on the same basis as officers, and in fact, it reduced the officers' mileage rate from 8 to 6 cents a mile and increased the enlisted man's rate to 6 cents a mile.

The over-all cost of travel has gone up in 1952 over 1951 due to the tremendous increase in the size of the Army. For example——

Senator THYE. Well, my question was as to the percentage, in relation to the appropriations in previous budgetary measures. So your percent, whether your Army was increased or not, would run along about somewhere in relation to that.

Mr. MENEFEE. In 1952, there is a 41-percent increase in the size of the Army; and the increase in 1952 travel requests over 1951 is 43 percent.

Senator THYE. However, your budget would have to be for not only subsistence, but pay, and all, for the military forces that you

would have, and in relation to the increased number of personnel. And my thought here was, How does your expense item compare, in percent, with the expense item percent in previous appropriations? In other words, are we traveling more with our troops, or traveling our troops more this period than we were during World War II or in, we will say, last year?

Mr. MENEFEE. I think that would have to be a statement we would have to work up for the committee.

(The information referred to is as follows:)

Percentage relationship of funds appropriated for travel of the Army to funds appropriated to Finance Service, Army, fiscal years 1946–52

Fiscal year	Finance Service, Army	Travel of the Army	Percent of travel to total
1946	$6,853,139,000	$720,000,000	10.5
1947	3,051,800,000	175,000,000	5.7
1948	2,549,755,700	135,000,000	5.3
1949	2,493,642,000	145,000,000	5.8
1950	1,559,615,000	80,000,000	5.1
1951	2,660,130,000	177,000,000	6.7
1952 [1]	3,610,848,000	254,000,000	7.0

[1] Budget estimate.

Senator THYE. It seems to me that your percent for travel here is rather high in comparison with your over-all appropriation request. That is the way it struck me, and I just wondered whether I was correct in my thought that your travel expense was high, in percent to your over-all budget.

Colonel PERMAN. In the process of induction, we must transport the man first to an induction center, where he receives an examination to determine whether or not he is fit; and then that man is returned to his home for 21 days prior to reporting to a reception center. So you would have that travel, which we did not have last year or in other peace years.

From a reception center, he must then go to a replacement training center, where he receives his training; and then travel to a unit where he is assigned afterward.

Now, in normal peacetime, we eliminate a lot of that travel through the voluntary recruitment system, which sends the man directly to a station. So that I would say that our percentage of travel in that particular phase would, percentagewise, increase the amount of travel.

I have here a little sketch of the travel of a man coming into the Army, before he is finally sent overseas and gets into combat.

Senator THYE. You have made a thorough study of that to determine whether you could cut straight across and eliminate a couple of these circles?

Colonel PERMAN. That is correct.

Senator THYE. I am now looking at the chart, and it shows a complete circle, and then some zigzags, and I wondered if you had made a study of this so that you could cut right across.

Colonel PERMAN. A study has been made of that, and we showed schematically the various things that enter into the travel.

Similarly, we have a diagram prepared which shows what happens when the man comes home, and before he is discharged; and again, an increased amount of travel, in some cases.

SHIPPING OF ORGANIZATION EQUIPMENT

Mr. MENEFEE. There is another sizable item that enters into the travel picture which makes a comparison to a normal peacetime year out of proportion. That is the cost of shipping organizational impedimenta and equipment. For example, in 1950, when we were on a normal year, we spent about $12,000,000 for shipping equipment and organizational impedimenta; but this year, in moving so many divisions to west coast ports, we estimate we will spend about $38,000,000 on transportation of impedimenta and equipment.

Colonel BUDGE. It may be interesting to the committee to have this information. I had a study made for us by the Transportation Corps, in the cost of moving an infantry division with 50 percent of their equipment and impedimenta from Fort Bragg, N. C., to San Francisco. The selection of the two points was arbitrary. It cost $3,874,585 to make the move. Where you have troop movements involved, the travel cost is considerable.

Senator O'MAHONEY. This does, of course, include the travel of soldiers returning on rotation?

Colonel BUDGE. That is right, sir. Their travel is also included in this project.

Senator O'MAHONEY. Which, of course, adds a very substantial item to the cost.

Colonel BUDGE. That is right.

TRAVEL BUDGET

Senator O'MAHONEY. The justification, on page 124, shows that under the summary of direct obligations, by projects, travel of the Army, the actual appropriation for fiscal 1950 was $78,174,539. The estimate for fiscal 1951 totaled $176,996,000; and that for 1952 is estimated at $254,000,000 which, of course, is an increase of $77,004,000 above 1951.

TRAVEL OF INDIVIDUALS

Now, this is divided into travel of individuals and organized units, permanent change of station, which is the largest of the three items or the four items, and $223,500,000 is provided there.

Travel of individuals other than permanent change of station, $18,000,000.

Furlough, which was in fiscal 1950, disappears both from 1951 and 1952, and I shall ask you "Why?" in a moment.

The fourth item is temporary-duty travel of individuals attending schools, which, for 1952, you estimate at $12,500,000.

It would appear that the first item includes the pay of persons or at least the travel pay of persons on discharge, amounting to approximately 630,000 individuals. What is the average number of persons that you expect to discharge from the Army every year?

Mr. MENEFEE. The plan on which this budget was based, sir, was approximately 630,000 individuals leaving the Army.

Senator O'MAHONEY. But how did you reach that figure?

Mr. MENEFEE. That was determined by the General Staff, sir, and included in the budget directive for this computation.

Senator O'MAHONEY. There must have been a formula by which you reached that figure.

Colonel SKELLS. At the present time, the losses for the year——

Senator O'MAHONEY. Is this made up of termination of enlistments, chiefly?

Colonel SKELLS. That accounts for a good part of it.

MILITARY SEPARATIONS

During this coming year, there will be a large number of separations; around 100,000 enlisted personnel are expected to be released to civilian life during the fiscal year 1952, and that will account for a good deal of this travel, the travel time of those people after they are separated from the service.

Senator O'MAHONEY. Could you break it down into categories? Are young men being discharged in any substantial numbers?

Colonel SKELLS. Yes. First are the people called into the service involuntarily—they are in the highest priority for release from the service and will be considered before other categories of personnel.

Senator O'MAHONEY. I wonder if you could give us a breakdown of that figure, and prepare it for the record? You apparently do not have that with you.

(The information referred to is as follows:)

Distribution of Army losses used as a basis for fiscal year 1952 budget estimates

	Thousands
Officers (male and WAC)	26.9
Army nurses and Women's Medical Specialist Corps	1.9
Warrant officers	1.2
Enlisted personnel	610.5
Cadets, U. S. Military Academy	.5
Total losses	641.0

RECAPITULATION OF ENLISTED LOSSES

Total enlised losses	610.5
Less immediate reenlistments	192.0
Net loss to Army	418.5
Expirations of enlistments:	
Due in fiscal year 1951 [1]	172
Reenlistments in 1951	−63
Reenlistments in 1952	−44
Net loss in 1952	65
Due in fiscal year 1952 [1]	213
Reenlistments in 1952	−148
(Reenlistments in 1952, 44 + 148 = 192.)	
Regular Army separations	65.0
Regular Army attrition (6 percent year) retirement:	
Nondisability over 30 years	1.0
Physical and mental (other than retirement)	10.0
Other causes (dependency, minority, commissions, etc.)	15.0
Other than honorable	10.0
	36.0
Inductee attritions (10 percent)	65.0
Enlisted Reserve separations	120.0
National Guard separations	88.0
Casualties (Korea)	44.5
Total	418.5

[1] Extended for 1 year.

MISCELLANEOUS TRAVEL ACTIVITIES

Senator O'MAHONEY. On the item of travel of individuals other than permanent change of station, for which there is an estimate of $18,000,000—and this appears on page 126 of the justification—we are told in the justification that this includes, "Travel in connection with investigations, inspections, schools, safety programs, industrial mobilization, recruiting, audit, intelligence, and counterintelligence, and security courier service."

TEMPORARY DUTY TRAVEL

The next item is temporary duty, travel of individuals attending schools, for which there is an estimate of $12,500,000.

Is there any duplication there, since schools are included in the $18,000,000 item?

Colonel BUDGE. There is no duplication. In connection with schools under project 432, or the first one that you mentioned, is concerned only with the administration of the schools. In project 439 it is for the travel of the students attending schools, sir. There is no duplication.

Senator O'MAHONEY. How about the inspections? Does that include travel for the Inspector General's Division, and all of that is included there?

Colonel BUDGE. Yes, sir.

Senator O'MAHONEY. All right, you may proceed.

Colonel SMITH. Specifically, the 1952 troop program provides for an increase of approximately 442,000 man-years over 1951, including a considerable increase in oversea deployment, as has been previously stated in an off-the-record discussion.

It is further pointed out that much of our travel expense is beyond the scope of administrative control. For example, the rotation of combat veterans, oversea movements in support of international commitments, and travel upon separation from the service.

In general, the amounts requested for temporary duty travel are projections of current obligation rates in relation to expanded activity.

In brief summation of the 1952 travel request, there is a 41-percent increase in the 1952 average troop strength as compared to 1951; the 1952 travel request exceeds 1951 appropriations by 43 percent. Increases in oversea deployment and rotation of combat veterans account for the difference.

FINANCE SERVICE, ARMY

The $48,423,000 requirement for this subappropriation is shown in detail on page 133 of the justifications.

Of this amount, $38,594,000 is to provide for field employees of the Finance Corps, $5,679,000 for field employees of the audit agencies, $3,450,000 for field employees of the Comptroller in major commands, and $700,000 for miscellaneous financial activities, such as losses in disbursing officers' accounts resulting from combat operations.

PERSONNEL

The $38,594,000 for finance personnel is a reflection of the expanded military program which has caused a heavy increase in personnel required for the payment of troops, civilian employees, and commercial accounts. Furthermore, the planned relocation of the Army Finance Center at Fort Benjamin Harrison, Ind., creates the necessity for a temporary overstrength during the transition period to insure no interruption in the payment of dependency allotments and other assigned missions.

AUDIT PERSONNEL

The $5,679,000 requested for audit personnel is a direct result of the increased procurement program. For example, during one quarter of 1951 the volume of contractor costs to be audited increased from approximately $159 to $377 million, or 137 percent. These personnel are essential in the protection of the Government's interests.

FIELD EMPLOYEES

The $3,450,000 requested for field employees of the Comptroller in major commands provides for personnel whose principal function is the efficient utilization of manpower in terms of appropriations. This function becomes increasingly vital as defense costs grow.

These are the high lights. The justifications before you give in detail the computations on which the 1952 estimates were made.

Representatives of my office and the General Staff are here to assist in answering any detailed questions you may have.

That ends the presentation, Mr. Chairman.

LANGUAGE CHANGES

Senator O'MAHONEY. Let us refer to this change in language which is set forth on page 120. The word "transportation" is inserted, apparently. Is there any special reason for that? The old law was "for pay and allowances," and now it is "for travel and transportation allowances."

Mr. MENEFEE. Mr. Chairman, I am not in a position to discuss the changes in language, which I believe are presented for all appropriations at one time by the legal adviser of the Office of the Comptroller.

General DECKER. We plan to make a separate presentation of that, if it meets with the wishes of the committee.

Senator O'MAHONEY. That is all right. Who will present that?

REIMBURSABLE OBLIGATIONS

General DECKER. Mr. Tracy, the legal adviser to the Comptroller, will present those language changes.

Senator O'MAHONEY. On page 121 of the justification, we start out with the total estimate of the appropriation for 1952 for travel of the Army, at $254,000,000. On the next page, 122, we have an item of reimbursable obligations, reimbursement for services performed, which you estimate for 1952 at $844,000. It was $1,040,000 in 1951, and $1,600,000 actual expenditure in 1950.

May we have a description of that item?

Mr. MENEFEE. The principal change in the $844,000 estimated reimbursements for 1952, and the $1,040,000 for 1951, is in the item of reimbursement of travel expenses for officers assigned to Selective Service. The big expansion in the officers assigned to Selective Service took place in 1951.

Senator O'MAHONEY. Who makes the reimbursement?

Mr. MENEFEE. The Selective Service appropriation provides for reimbursing the Army for the pay and travel allowances of the officers.

Senator O'MAHONEY. Does that account for the entire item?

EXPENSES OF MILITARY PRISONERS

Mr. MENEFEE. No, sir; that accounts for $44,000 of the item in 1952, and $240,000 in 1951. Of the remaining $800,000 for fiscal year 1952, $790,000 is the estimated reimbursement for travel incident to the delivery of soldiers absent without leave, deserters, and escaped military prisoners.

The regulations provide that when a soldier is absent without leave and is apprehended, his pay is charged for the amount of the travel expense returning him to military control.

The other item of $10,000 for each fiscal year is for transportation and meals furnished to enlisted men who are picked up without funds and who must be furnished transportation and meals back to their post.

Senator O'MAHONEY. We are talking about reimbursement.

Mr. MENEFEE. That is correct.

Senator O'MAHONEY. By whom is this reimbursement made?

Mr. MENEFEE. The reimbursement is made from the man's pay account when he is returned to military custody. For example, if he loses his ticket in transit or his money, he may turn in to the closest transportation officer and receive transportation back to his home post, including meals en route, for which he subsequently must reimburse the Government.

Senator O'MAHONEY. In summary, $44,000 of this estimate will be from Selective Service, and the rest will be from the soldier himself, who is AWOL, or subject to other disciplinary action?

Mr. MENEFEE. Right sir. And the details are shown on page 128.

OTHER CONTRACTUAL SERVICES

Senator O'MAHONEY. On page 123, you have the total amount, estimate of 1952, for travel, as $193,080,000; the transportation of things, $55,340,000; and other contractual services, $5,580,000, making up this total estimate of $254,000,000.

What are these "other contractual services"?

Mr. MENEFEE. That is packing and crating incident to a movement of an individual's household goods, where he is living in a metropolitan area, as distinguished from a post. If he were on a post, the packing and crating would be done by the post engineer and charged to Engineer Service, Army, but where he is in a metropolitan area, he gets permission to have a commercial firm do his packing and crating, which is charged to this appropriation.

Senator O'MAHONEY. There is a limit on the amount of the contract, of course?

Mr. MENEFEE. Yes. It is based on his household allowances.

Senator O'MAHONEY. And these three items make the total of the $254,000,000 we have already discussed?

Mr. MENEFEE. Yes, sir.

Senator O'MAHONEY. Are there any other questions on travel?

TRAVEL PROCEDURE

Colonel SKELLS. I think I could add something to this question of travel, sir. G–3 is the General Staff division that controls the travel of units from one Army area command to another. On top of that, the Army commanders in the Army areas control travel within their own Army areas, and they have a directive from G–1 that governs that travel. It is worded in such a way that Army commanders are required to watch and control the travel very closely, and they are to limit temporary-duty travel to the barest possible that is necessary.

But anything that is concerned or necessary for carrying on training, they may do, and it is within their prerogative to do so.

Travel of individuals coming from civil life into and through the training system is controlled by the Department of the Army, and I might say that in this particular period that we are going through now, where inductees are being brought into the Army for only 2 years, the travel is of necessity increased over normal times. In normal times, with a 3-year period of enlistment, the turn-over of personnel through the Army Establishment is much less, and that accounts for a good part of the increase in travel required at this particular time.

I would say approximately two-thirds of the Army at the present time is short-service personnel; they are in for about 2 years and out. And that certainly increases the travel costs.

INCREASE IN PERSONNEL

Senator O'MAHONEY. I am checking the justification on page 133, of $48,423,000, Summary of the Direct Obligations of the Finance Service, which includes the "Field employees of the Finance Corps," "Field employees of the Army Audit Agency, and audit agencies, oversea commands," and "Field employees of the Office of Comptroller," and "Miscellaneous financial activities," all of which total $48,423,000.

You apparently have increased the personnel of the finance service from 11,532 in 1951 to 16,281 for 1952. Would you amplify that a little bit, please?

Mr. MENEFEE. We are talking there again in terms of the average personnel. We started the current fiscal year with about 7,350 people in the Finance Corps, and ended the year with around 11,641. The personnel were phased in throughout the year as camps, posts, and stations were opened, in line with the expanded military activity.

The 1952 comparative figure of 12,175 as against the 8,701 for 1951 provides for those people who came in on a staggered basis in 1951, continuing at full employment throughout the whole of 1952.

Senator O'MAHONEY. There has been considerable interest in the number of civilian employees, and how many of these are civilians?

Mr. MENEFEE. These are all civilians, sir; all in the field.

MANPOWER-CONTROL CEILINGS

Senator O'MAHONEY. What steps have been taken to hold the number down?

Mr. MENEFEE. I think that that would fall within a general statement on holding all civilian personnel down, which Colonel Perman can better comment on.

Colonel PERMAN. Manpower-control ceilings have been established by the Secretary of Defense. Currently, the function rests in G–1 of the control of civilian personnel. We have made analyses and measured workloads to determine the requirements for personnel.

After careful review and application of these various yardsticks and ratios that are established by the Bureau of the Budget and other agencies, we provide the civilian personnel spaces. To insure, however, that the utilization in the field is as we had planned it and expect it to go, we have various teams of officers who go into the field installations and actually examine the utilization of personnel to insure maximum economy, that they are not overstaffed in various areas, by actually checking the workload. We will go into a headquarters and have personnel count the number of pieces of paper that an individual processes, and go into a depot and see how many people they have processing requisitions, and how many items are processed. We go into the ports and check the number of personnel that they have per item on a bill of lading.

It is through those management techniques that we feel quite sure that we are making an have made great strides in keeping our civilian personnel to a minimum consistent with our workload.

AUDIT AND CONTROL OF CHECKS

Senator O'MAHONEY. What do you do by way of audit and control to prevent the issuance, erroneous issuance, of checks and the like?

Colonel SMITH. That is handled principally in the audit at St. Louis. That is handled in two ways: One, by the General Accounting Office, which goes over every voucher the disbursing officer may have processed in the way of check or cash payments. They set up controls in the General Accounting Office; and in addition thereto, with respect to military pay, the military-pay record of the individual is sent to St. Louis twice each year, for the period January 1 to June 30, and from July 1 to December 31.

There the military-pay records are put through the electrical accounting machines, which automatically balance those cards to make sure that the amount of money that the man was entitled to agrees with the amount of money that he was paid.

I think that we have just about as comprehensive a check as we can possibly get through those two sources.

Senator O'MAHONEY. Were there not some inefficiencies disclosed a couple of years ago at St. Louis?

Colonel SMITH. After a very exhaustive examination by the Inspector General's Department and others, it was found out that they were doing a magnificent job in St. Louis, and that the charges were practically entirely unfounded.

I think that there is only one thing that I can recall, offhand, now; that was a charge made that the security officer was a warrant officer,

and he should have been an officer. And nothing had ever come up on a security basis that would have warranted it except that they thought more rank should be charged with that responsibility.

Senator O'MAHONEY. There were no disclosures of overpayments?

Colonel SMITH. Definitely there were, sir. That was done during the war, and we have known that, and we have admitted it. During the war we had to take a calculated risk; in other words, we leaned over backward to make sure that dependents got their money. In other words, if there was any question about it, the dependent got it, and we checked afterward.

Well, there were millions and millions of those payments that were made, and it took time in order to go into them, to make a comparison to see whether or not an overpayment had or had not been made. But, after the discovery of the error, we then proceeded to make the collections.

COLLECTIONS OF OVERPAYMENTS TO DEPENDENTS

Now, the procedure there was rather complicated, to this extent: Because of inequities, they might excuse the overpayment. It might be possible that a man was divorced, and the payments had continued to be made to a divorced wife, for which he gained no benefit, and in that case it would be excused.

On the other hand, where there was no reason why the individual should not pay, we have made collection efforts; and where we have been unable to effect collection, we have turned the matter over to the General Accounting Office, who is continuing with collection efforts in order to reimburse the United States as far as practicable for these overpayments.

Senator O'MAHONEY. Have collections been made?

Colonel SMITH. Definitely; yes.

Senator O'MAHONEY. In what amount?

Colonel SMITH. I would have to put that in the record. It ru into millions of dollars; I do not remember the exact amount.

Senator O'MAHONEY. Will you please put that in the record?

Colonel SMITH. Yes, sir.

(The information referred to is as follows:)

Status of Army Finance Center collection account for family allowances (class F) under the Servicemen's Dependents Allowance Act of 1942—July 1, 1942 to June 30, 1951

Established due the United States		$43, 658, 511. 29
Collections	$34, 870, 772. 55	
Declared uncollectible	1, 647, 539. 90	
Waived under provisions of sec. 12, 56 Stat. 381 and sec. 13, Public Law 771, 81st Cong	3, 648, 520. 53	
Canceled by remission under provisions of act of May 22, 1928, 45 Stat. 698, as amended	1, 069. 45	
Total		40, 167, 902. 43
Balance due the United States		3, 490, 608. 86

Senator O'MAHONEY. You want the committee to understand, I take it, that these overpayments were by reason of error only, and not by reason of any conspiracy or defalcation?

Colonel SMITH. That is definitely our feeling in the matter; yes, sir. In other words, the human element entered into it. For example, we had to take on thousands of employees who were submarginal, you might say, in their abilities, and so on. But the job had to be done, and, of course, the number of errors mounted up in proportion to the abilities of individuals and machines to process the tremendous workload.

Senator O'MAHONEY. Have any new steps been taken to prevent a recurrence of error of that kind?

Colonel SMITH. There has been, by the process of reconciliation of (1) the amount of money that was collected from the individual, and I refer specifically to the class Q allotment; and there is a reconciliation made between the amount collected from the man for his portion of the allotment, and (2) amount paid out at the Finance Center for the Government's contribution. That has to balance.

Senator O'MAHONEY. With respect to the overseas commands, that is a rather difficult operation; is it not?

Colonel SMITH. I do not quite follow you there, Senator.

EXPENSES OF OVERSEAS COMMANDS

Senator O'MAHONEY. You have a payment there for fiscal 1952—an estimate, I should say, of $1,718,000 for the overseas commands. I would imagine that it was more difficult to conduct your finance activities for the overseas commands than for commands within the United States.

Colonel BUDGE. I would like to point out that it is much more difficult. I have just recently returned from the Far East Command, and can speak of my own personal knowledge. It is much more difficult overseas to effect finance service than it is stateside.

Senator O'MAHONEY. What precautionary steps are taken overseas?

Colonel BUDGE. I do not understand your question.

Senator O'MAHONEY. To prevent error, waste, duplication, and that sort of thing?

Colonel BUDGE. Sir, that is the task of the particular disbursing officer who has charge of that operation. It is his task to follow through and see that his personnel are well trained, and conduct a consistent training program within the office itself.

Senator O'MAHONEY. I am frank to say to you that I would not want to handle it myself, or have the responsibility of handling it, but I would like to have a record made here.

Colonel BUDGE. It is a good deal of responsibility. I was disbursing officer for the Ryukyus Command on Okinawa, and at that time had approximately $3,000,000 of cash in my custody at all times. The personnel that I received were not too well trained at the time they arrived, and it was my responsibility to see that they were trained, and that erroneous payments were not made.

At times, probably, I had some overstrength in my office to compensate for this lack of training on the part of the personnel. But I can assure you that I have just received information that the work was fairly well handled.

Senator O'MAHONEY. I wish that your smile could be recorded here in this transcript, sir.

The exact steps that you take have not been quite made clear, it seems to me, for the record, to see that these payments are efficiently managed.

DISBURSEMENT OFFICE

Colonel BUDGE. In speaking of the disbursing office itself, after the vouchers are made up, they are processed through what we term "an audit section." All of the vouchers are audited thoroughly prior to the time that the payment is effected.

Your vouchers, as Colonel Smith has explained, are sent to St. Louis, and there again they are given an administrative audit. And finally the vouchers to the General Accounting Office, who give them a third audit. In the event there has been an erroneous payment, you are immediately notified, and you rectify the situation.

Does that answer your question?

Senator O'MAHONEY. What I would like to ask you to describe is the way in which this very large amount of cash is handled, because I assume if that was done in the Far East, it is also being done in Europe.

If you will pardon me, I will have to have a slight interruption.

Chairman MCKELLAR. You take this $3,000,000 cash fund, and have any defalcations of any kind occurred?

Colonel BUDGE. No, sir, and it is a matter of record, sir.

The reason the finance office was required to carry such large sums of cash is the fact that no banking facilities existed on Okinawa, and we were required to keep an ample supply of money, in order to perform our mission which also entailed the funding of Air Force disbursing officers. That is the reason why, at that particular post, the finance office was required to carry so much money. Insofar as the internal operation of the office is concerned each night, after a day's operations, a balance is taken just the same as in any of your large banks. Once a month disinterested officers come in, count your cash and verify that it agrees with the balance of your account.

Your account, in turn, is checked and balanced at the Army Finance Center in St. Louis, and it is also checked and balanced at the General Accounting Office.

So far as the physical protection of the money is concerned, we have reinforced concrete vaults, and responsibility for a 24-hour guard of the money.

PAYMENT OF CASH TO MILITARY PERSONNEL

Senator O'MAHONEY. Have the military personnel been paid in cash, then?

Colonel BUDGE. That is right, sir.

Senator O'MAHONEY. How do they exchange this cash?

Colonel BUDGE. In the Far East Command, they are not paid in United States currency, Mr. Chairman. They are paid in what is called military payment certificates. These certificates can be utilized by those personnel in the PX's, or for buying postal money orders to send the money home. They use that money just the same as they do in the United States, although it does not enter into the foreign economy, as you can readily see.

FOREIGN CONVERSION MONEY

Senator O'MAHONEY. If they want to make purchases in the foreign economy, how is that handled?

Colonel BUDGE. They convert the military payment certificates to foreign currency at the Finance Office. It is an additional duty of the Finance Office to accept their MPC's, and, in turn, sell them foreign currency, at the prevailing rate of exchange.

Senator O'MAHONEY. And precautions are taken against the creation of a black market in American currency?

Colonel BUDGE. That is an additional and an important duty for finance personnel.

Senator O'MAHONEY. Is it successfully carried out?

Colonel BUDGE. It is, sir.

Senator O'MAHONEY. Is it successfully carried out in Europe?

Colonel BUDGE. I couldn't say. I am not acquainted with that area.

CURRENCY CONTROL TO COMBAT BLACK MARKET

Colonel PERMAN. As you may remember, Mr. Chairman, in Europe we established a currency control in order to combat the black market. Even though you had procured an excessive amount of script or the other foreign currencies, you could not convert those into dollar instruments, and you could convert only that which was up to the amount of pay that you had received during your stay in the theater. You could not have money sent in to you, or get foreign currency and exchange it and then go through the various machinations and come up with more dollars than you had received in pay.

Senator O'MAHONEY. And that system is still in use?

Colonel PERMAN. They no longer have the currency control books in Europe which they used to have, but they keep a very close check on the activities of the individuals in such areas.

Senator O'MAHONEY. Is it successful, without the control books?

General MOORE. Mr. Chairman, the same procedure prevails in the European countries as was just described by Colonel Budge. In other words, the scrip is used, and to the extent that they convert that to local currencies, they are not privileged to reconvert back into dollars. That is the factor that constitutes the protection for our Government.

Senator O'MAHONEY. Where is this scrip made?

Colonel SMITH. It is made in the United States.

Colonel BUDGE. I think, sir, it is printed by the Bureau of Printing and Engraving.

Senator O'MAHONEY. It is of no value in the United States?

Colonel BUDGE. It has no value in the United States.

Senator O'MAHONEY. You might bring some up and let the committee see it some day.

General Decker, when do you want to put on the explanation of the change in language, since it comes in this item?

General DECKER. That usually comes at the conclusion of the hearing of all of the estimates, sir; it is a separate presentation.

Senator O'MAHONEY. But the change of language I am discussing is the change under the Finance Service, Army.

General DECKER. There will be changes in language in some of the other appropriations.

Senator O'MAHONEY. All of the way through, you want to discuss it at one time?

General DECKER. And discuss it last, if we may.

Senator O'MAHONEY. Very well, that is all right.

Now then, apparently, unless there are more questions, at this time we have exhausted this item, except for more details. However, I understand the Research contingent of witnesses has not yet arrived.

General DECKER. They are on the way, sir; they have not arrived yet but I expect them any minute.

I considered that the committee would probably get more out of the presentation of Research and Development if we presented it as a single package. There is some money for this in each of the seven technical service appropriations, but I believe you will get a better picture of the whole Research and Development program of the Army if we present it to you all at one time.

CONTRACTUAL SERVICES

Senator O'MAHONEY. Let me ask Colonel Smith this question: Can you describe all types of contractual services under the heading of the Finance Division?

Colonel SMITH. That is a big order.

Senator O'MAHONEY. I notice it is scattered through here.

Colonel SMITH. Yes, sir. I will be glad to put a complete breakdown in the record.

Senator O'MAHONEY. Suppose you do that. We would appreciate it.

(The information referred to is as follows:)

Distribution of object class 07—"Other contractual services" Finance Service, Army fiscal year 1952

Project 411—Apprehension of deserters and payment of authorized donations	$315,000
For rewards to civilian authorities, and expenses of confinement of military prisoners in nonmilitary facilities.	
Project 412—Expenses of military courts, boards, and commissions	150,000
For stenographic reporting incident to courts martial, courts of inquiry, military commissions, retiring boards, etc.	
Projects 413—Pay of civilian employees at military headquarters	103,000
Reimbursement to Public Buildings Service for security guards.	
Project 431—Travel of individuals and organized units, permanent change of station	5,580,000
Contract packing and crating of household goods.	
Total	6,148,000

Senator O'MAHONEY. General Decker, Colonel Smith, and your associates, on behalf of the committee I will express our appreciation for the presentation you have made this morning.

Assistant Chief of Staff, G–4

RESEARCH AND DEVELOPMENT DIVISION

STATEMENTS OF MAJ. GEN. WARD H. MARIS, CHIEF, RESEARCH AND DEVELOPMENT DIVISION, G–4; COL. WILLIAM S. TRIPLET, CHIEF, PLANNING BRANCH, RESEARCH AND DEVELOPMENT DIVISION, G–4; MAJ. GEN. WILLIAM O. REEDER, DEPUTY, ASSISTANT CHIEF OF STAFF, G–4; LT. COL. LAURENCE T. KING, CHIEF, BUDGET SECTION, PLANNING BRANCH, RESEARCH AND DEVELOPMENT DIVISION, G–4; COL. RICHARD D. MEYER, COMMANDING OFFICER, TRANSPORTATION RESEARCH AND DEVELOPMENT STATION, OCT; BRIG. GEN. LESLIE E. SIMON, CHIEF, RESEARCH AND DEVELOPMENT DIVISION, OC/ORD; LT. COL. DAVID G. HAMMOND, CHIEF, RESEARCH AND DEVELOPMENT DIVISION, OCE; JOHN W. MOCKABEE, RESEARCH AND DEVELOPMENT BRANCH, OQM; LT. COL. C. A. BROWN, CHIEF, ENGINEERING AND CONTROL BRANCH, OC/SIG O; COL. FREDERICK J. KNOBLAUCH, ASSISTANT CHAIRMAN, MEDICAL RESEARCH AND DEVELOPMENT BOARD; LT. COL. HAROLD E. RATCLIFFE, ARMY MEDICAL RESEARCH AND DEVELOPMENT BOARD; COL. CARY J. KING, JR., ASSISTANT CHIEF, ENGINEERING AND TECHNICAL DIVISION OC/SIG. O; BRIG. GEN. R. S. MOORE, SPECIAL ASSISTANT TO ASSISTANT SECRETARY OF DEFENSE, COMPTROLLER; AND COL. J. F. THORLIN, CHIEF OF TANK AND AUTOMOTIVE BRANCH, RESEARCH AND DEVELOPMENT DIVISION.

GENERAL STATEMENT

Senator O'Mahoney. Will you proceed with your testimony on research and development. I take it that General Maris is to present it.

General Maris. Mr. Chairman and members of the committee:

The ultimate success of our Army in any war which may be forced upon us in the foreseeable future will be determined largely by our ability to achieve the qualitative superiority in weapons, equipment, techniques, and morale necessary to overcome the numerical superiority of a potential enemy. The accomplishment of the greatest possible advance toward this objective during the coming year is the mission of the Army's fiscal year 1952 research and development program. We have made significant and encouraging strides in this direction in 1951. In accordance with strategic guidance, we intend to continue this progress at an accelerated rate in 1952. To do this we will need the financial support we are now asking.

Our 1952 research and development program is a carefully considered, well integrated plan, designed to provide: (1) the increased entry of new and better ideas into the production of improved prototype end items; (2) a highly accelerated effort to meet the demands of the threatening world situation, and (3) a more stable and complete research and development program.

We plan to effect considerable improvement in our present weapons systems and equipment on a short-term basis, while pursuing the longer term new and more technically advanced systems as fast as the state of the art and the most judicious use of funds will allow.

This program was developed to meet specific objectives established by the Army under key policies enunciated by the National Security Council, strategic guidance from the Joint Chiefs of Staff, scientific and technical guidance from the Research and Development Board, and from our numerous scientific consultants and advisers, statements of requirements from the using arms and services as set forth in the Army Equipment Development Guide, and new requirements stemming from the dictates of operational action in Korea and from capabilities resulting from advances in science arising from basic research.

RESEARCH PROCEDURES

Before describing our program, I would like to explain the procedures in the evolution of a research and development project from the inception of an idea to the final end item, and summarize briefly some of our accomplishments of the past year.

Senator O'MAHONEY. May I interrupt you there, General? There are some items raised by this last paragraph. You referred to the "key policies enunciated by the National Security Council."

General MARIS. The policies of the National Security Council with respect to our readiness, our national-security readiness. Those are highly classified documents, from which have been extracted the indication of the dates we should be prepared for any emergency, primarily, and the status of readiness which we should achieve.

Senator O'MAHONEY. Of course, it must go beyond that, and that is a very general statement that would cover any activity of any of the military forces.

General MARIS. That is quite true.

Senator O'MAHONEY. I am talking now about the key policies in research and development. How extensive are these policies?

RESEARCH AND DEVELOPMENT BOARD

For the record, what is the Research and Development Board?

General MARIS. The Research and Development Board is an agency of the Department of Defense. The membership includes the Chairman, who is appointed by the President, two members each from the three services; one member is of the Secretarial level, an Under Secretary or an Assistant Secretary, and the military member is usually the head of the Research and Development establishment of the Army, Navy, or Air Force. That is the Board itself. It has a large staff of scientific and technical experts, and it has available to it numerous committees and panels of the highest scientific talent of the country, who review our programs, who review the items, and give advice with respect to the programs themselves and to the individual items, all of the way through, and finally recommend approval or disapproval, as the case may be, of our proposed programs.

They may also make recommendations for changes. Generally, they give us technical and scientific guidance throughout the entire program.

Senator O'MAHONEY. You refer to "our numerous scientific consultants and advisers." Are they different persons from those who work with the Research and Development Board?

General MARIS. Usually they are different, but sometimes they are the same, due to their qualifications. They might be serving in dual capacities.

Senator O'MAHONEY. What I am driving at, do we have duplication here?

General MARIS. No, sir.

In connection with their functions with the Research and Development Board, these scientists study the programs presented under the budget provisions.

Senator O'MAHONEY. General, I think you misunderstand me.

General MARIS. The Research and Development Board——

Senator O'MAHONEY. The Research and Development Board, as you have just described it, consists of the persons whom you have named, and they have a staff of scientific advisers and consultants. Now, do you also have a staff of scientific advisers and consultants?

SCIENTIFIC ADVISERS AND CONSULTANTS

General MARIS. We have scientists throughout all of the technical services, working on specific items.

Senator O'MAHONEY. Now, "consultant" means a person not regularly employed, but who is called in from time to time.

General MARIS. Yes, sir.

Senator O'MAHONEY. So, do we have two staffs of consultants, one retained by the Board itself, and one retained by the research and development bureaus or divisions?

General MARIS. The members of the committees and panels of the Research and Development Board are not full-time individuals. They come in from time to time for the meetings of the panels and committees. They are not full-time personnel.

Now, we call in, from time to time, consultants with respect to a particular item. For instance, let us take this item——

Senator O'MAHONEY. When you say "we," who do you mean?

General MARIS. The Army.

Senator O'MAHONEY. This is something separate and apart from the Research and Development Board?

General MARIS. Yes, sir. We go out for the best scientists along the particular line involved, people who are experts in the particular field.

Senator O'MAHONEY. I have no doubt the type is very high, but my question is prompted by your phrase which reads:

> This program was developed to meet specific objectives established by the Army under key policies enunciated by the National Security Council, strategic guidance from the Joint Chiefs of Staff, scientific and technical guidance from the Research and Development Board and from our numerous scientific consultants and advisers. * * *

Then, in response to a question of mine asking for a definition, for the record, of what the Research and Development Board is, you referred to their consultants. So I want the record to be quite clear about whether or not there is any duplication between this group of

scientific consultants and advisers retained by the Research and Development Board, and by your organization.

General MARIS. No, sir. The Research and Development Board—

Senator O'MAHONEY. The best way to find that out is to have a statement made for the record giving us the number of scientific consultants and advisers employed by the Board and by your organization, and that will make it quite clear whether or not there is any duplication. That will show us what the complete personnel is. You may not have that with you, General, so just have it inserted in the record.

ADVISORY GROUPS

General MARIS. In that connection, sir, we have advisory groups at all levels, at all levels all of the way down through to the technical services, down to the laboratories, and down to the arsenals, on their specific items of equipment.

The panels and the Research and Development Board consider the entire program of all three services, and one of the principal reasons for that is to insure that there is no unnecessary or undesirable duplication between the three services in their general review of the entire program.

The program was built through a long process, and we have the advice of everybody in the various levels, all of the way through, up to the very end, and we also have the benefit of the best possible assistence from scientists not on a permanent basis. These are not permanent employees, because we reach out and get the advice from the best scientific talent as occasion demands.

Senator O'MAHONEY. Somewhere in this justification will appear the number and the compensation of these consultants and advisers at each level; and in due course, before this testimony is ended, I want it in the record.

General MARIS. We have a small number of full-time consultants but many of our consultants are not paid at all.

NUMBER OF CONSULTANTS

Senator O'MAHONEY. There are members of this committee who are constantly looking for loopholes, and constantly looking for ways to curtail expenditures, and I merely wish to have the record very clear on the point.

Now, if you will have that provided for the record, we will proceed.

(The information referred to is as follows:)

RESEARCH AND DEVELOPMENT BOARD

Consultants to Army research and development agencies work on a wide range of Army problems from the very specific to the broadest. Time devoted to these problems varies from a few hours or days to several months. Some are called on for a single problem; some at frequent intervals on numerous related problems. In either case they deal only with exclusively Army problems or with the Army aspects of problems of broader application.

Available data show that, during fiscal year 1951, 392 consultants were involved.

Figures as of July 1, 1951 show that there was a total of 557 part-time consultants from outside the Department of Defense to assist the Research and Development Board to review the research and development programs of the military departments and agencies of the Department of Defense. Of this total there are 314 part-time consultants who serve without compensation and 243 part-time consultants who are paid when actually employed.

ARMY EQUIPMENT DEVELOPMENT GUIDE

Senator O'MAHONEY. The next question that I want to ask, out of this very inclusive sentence of yours, General Maris, is a description of the Army Equipment Development Guide; what is that and how is it prepared?

General MARIS. We have this document. That is the document itself, and I should like to describe it, if I may.

Senator O'MAHONEY. If you will, please.

I observe it is labeled "Classified."

General MARIS. This document is the result of the findings of a board of senior officers of the Army, which was called about a year and a half ago to review the previous reports of the Stilwell Board, the reports of all boards which were convened during and after the war with respect to the equipment which we had and the equipment which we needed, and changes in the items themselves, with a view to determining (1) our most urgent needs in all fields, and (2) the equipment which we had on hand which should be improved, and items of equipment which we did not have on hand which should be developed.

Those are set forth in this Development Guide under—I believe on page 7 you will note the areas or fields of urgency which were set forth by this particular board.

Senator O'MAHONEY. I just happened by chance to open it at page 16, and I think that I will read this into the record from this document, because it is rather important; it comes under the heading "Section 3—Economy measures":

> 64. To obtain from available resources the maximum quality, quantity, and service in Army equipment, it is essential that every economy be stressed.

I think that that is a pretty good base from which to pursue your discussion of this appropriation, gentlemen.

General MARIS. That was one of the important items in connection with this study.

Senator O'MAHONEY. Now, you have made it clear, and you may proceed.

General MARIS. In normal times, a definite orderly course is followed in the development of an item of new equipment, from the origination of the requirement or idea until the item itself is placed in production.

Senator O'MAHONEY. Now you are reading something which is not in the statement before me. This is for the record, is it?

General MARIS. I have prepared a short and a long statement.

PROCEDURE ON MILITARY INVENTIONS

Although requirements arise from various military user sources, the majority come from Army Field Forces. They have recently been published in the Army Equipment Development Guide, which I have already mentioned. This guide is a down-to-earth resolution of the combat soldier's equipment problem, which was compiled by battle-experienced officers, reviewed by the general staff, approved by the Secretary of the Army, and published for the benefit of all agencies concerned with research and development. Recently, the Far East Command has also been the source of several requirements. Ideas also come from individual soldiers and citizens. Such ideas are

evaluated for us by the National Inventors Council, a volunteer group headed by Dr. Charles F. Kettering, working under the Department of Commerce.

An example of such an idea was the metallic mine detector, which was adapted from a proposal for a submarine detector submitted in 1941 by a citizen of Florida.

When a requirement has been established, the military characteristics are prepared by the user, and submitted to my office, the Research and Development Division, G–4, where it is reviewed, coordinated with all interested staff sections in the Army, and, where appropriate, with the Air Force and Navy. It is then assigned for development to the technical service having cognizance for the field to which it belongs. The technical service then evaluates the requirement from a technical point of view, coordinates it with other interested agencies, and initiates a development project through action of a technical committee, subject to general staff approval.

TECHNICAL COMMITTEES

Each technical service maintains a technical committee which includes membership from all the other technical services, Army field forces, Air Force, and Navy, appropriate administrative services, and British and Canadian representatives for tripartite standardization purposes.

Senator O'MAHONEY. That is the General Staff of the United States Army?

General MARIS. Yes.

The principal functions of the technical committee are initiation of development projects, adoption of new items as standard, other classification actions, and processing of procurement programs.

During the course of development, advice is obtained from numerous expert consultants, advisory boards, and committees, all comprised of scientists and engineers of the highest caliber, recruited from industry and the educational world.

The final phase of development consists of engineering tests of laboratory models to insure that the equipment is technically sound. Models are next given service tests by the user, to determine feasibility for operational use and what modifications are necessary before they are considered suitable for acceptance. After acceptance of the item by the user, it is submitted to the technical committee for standardization and to the General Staff for final adoption. Procurement is either approved in advance or recorded in the technical committee.

STANDARDIZATION OF EQUIPMENT

In this manner, the Army has standardized, since January 1947, more than 400 new items stemming from our post-World War II research and development program. Production of these new items, however, was on a very limited scale prior to Korea, due to lack of funds. Among those whose procurement was initiated were the 3.5-inch bazooka, which was just getting into production when the Korean affair broke out; several items of divisional communications equipment which have just begun to come from production, including an improved handie-talkie radio set, and lighter and smaller pack

radio sets for armor, artillery, and infantry, standardized in April 1950; and a new series of tank, artillery, and infantry vehicular radio sets, standardized late in 1948.

In cases of urgency, especially in wartime, it is necessary to accelerate these procedures by telescoping or short-circuiting some of these steps, even at the risk of adopting and producing some matériel that may not be entirely satisfactory initially.

Senator O'MAHONEY. May I interrupt to ask you whether, in your opinion, these new devices are not only scientifically successful and satisfactory, but that they also, before they are adopted and purchased and put on order for construction, have been reviewed for their essentiality?

General MARIS. Their adequacy; yes, sir, for the purpose for which they are produced, or to be produced.

NEW COMMUNICATIONS EQUIPMENT PLAN

Senator O'MAHONEY. They might be perfectly adequate and yet not be altogether essential. For example, let us take this improved handie-talkie radio set. How many of those, for example, would be put in use, and how many of them would actually be necessary and how many of them would it be possible to class as being merely luxuries, and not essential from the military point of view?

General MARIS. Colonel King, of the Signal Corps, may we have those two radio sets, the walkie-talkies?

That brings up a part of the new communications equipment plan for the entire Army.

Colonel TRIPLET. Mr. Chairman, I would like to show you these two radio sets, and I am speaking as an infantryman. This is not a luxury. I can state to you that this one is a man-killer. It is heavy, and our people are climbing hills in Korea now. They break down under more than a 40-pound load, on the average.

The Signal Corps has developed a new one, which Colonel King will tell you about.

Senator O'MAHONEY. When you use the phrase "man-killer," you mean it kills the man who carries it?

Colonel TRIPLET. That is right.

Senator O'MAHONEY. And the other is one which is much lighter?

Colonel TRIPLET. It weighs about half as much as the former set.

Senator O'MAHONEY. What is the essential character of this device?

Col. C. J. KING. This is a radio set for use in the forward areas, where it must be carried by a man who is given over to the job of taking the set; he is a communications man at the headquarters, and he has a set available either to transmit messages which are given him, or for use by his commander, who may take over the hand set and operate the set which is still supported by this communication medium.

IMPORTANCE OF COMMUNICATIONS SERVICES

General MARIS. One of the most important items is communications; the only way you can command and control your units in battle is by communications.

Senator O'MAHONEY. Do you want to say for the record that these instruments are essential to modern warfare?

General MARIS. Absolutely; yes, sir.

Senator O'MAHONEY. To enable the officers to communicate with the troops and the troops to communicate with the officers, and to keep in touch with headquarters command, and to make the military operation more efficient?

General MARIS. Yes, sir.

Col. C. J. KING. I might add that there is a natural limitation on the use of this equipment. There is a terrific shortage of available frequency channels, and so, unnecessary communications really cannot be tolerated, because unnecessary communications would prohibit the passage of these transmissions, and the number of channels is too restricted to allow extensive use of the equipment.

Senator O'MAHONEY. You are holding the new walkie-talkie set, and what does that weigh?

Col. C. J. KING. It weighs about 22 pounds.

Senator O'MAHONEY. And the other, the one which it displaces, weighs how much?

Col. C. J. KING. About 45 pounds, and it is just about double the weight.

Colonel TRIPLET. I would like to point out that these radios must be carried by the soldier in addition to his own housekeeping and battle load of ammunition and weapons. That is why we stressed the 22-pound model.

Senator O'MAHONEY. Very well, sir. Thank you very much.

General MARIS. The simplest method of telescoping development is to consolidate engineering and user tests, either by conducting them simultaneously on different models of the equipment, or jointly by the developing and using agency on the same models. This procedure is now being followed to the maximum extent feasible under current conditions.

PROCUREMENT OF EQUIPMENT

Procurement of the end item may be started at any time from initiation of the project to its completion. An early decision enables the producer to tool up, order materials, and be prepared to start production as soon as the development design is ready. Since this method short-circuits the engineering and user tests normally effected prior to production, provision is made for introduction of modifications during the course of production to correct deficiencies found during tests of early models.

Since the beginning of combat in Korea, production of new items has been greatly accelerated. Between June 25, 1950, and the present a total of 320 new items, resulting from the post-World War II research and development program, have been put into production. It is estimated that of $524,000,000 spent by the Army on research and development during fiscal years 1946 to 1950, inclusive, more than $187,000,000 was expended on the development of these new items alone.

Senator O'MAHONEY. That is more than half a billion dollars that has been spent on research and development in the 5 years of 1946 to 1950, inclusive?

General MARIS. Yes, sir; and of that, $187,000,000 was spent for research and development on items now in production.

During the period from now until July 1, 1952, more than 300 additional items of new equipment are expected to be placed into

production. These also represent a substantial pay-off from the post-World War II research and development expenditures.

Senator O'MAHONEY. Before we discuss that, would it be a proper conclusion to draw from your previous statement, that more than $187,000,000 of the $524,000,000 spent during this 5-year period was expended on the development of items now in production, and that the balance was spent on items which had to be discarded?

General MARIS. No. There are 300 more of these which will be coming in very shortly, and a great amount of this money sir, was in the very expensive field of guided missiles, which was a long-range program.

Senator O'MAHONEY. So that all of the returns from the $524,000,000 spent during the 5-year period are not yet in?

General MARIS. That is right.

Senator O'MAHONEY. You are looking for additional items of valuable new weapons?

General MARIS. Yes, sir.

Senator O'MAHONEY. And instruments to be used in warfare?

General MARIS. I might say, in that connection, sir, that in the interest of speed, it sometimes becomes necessary to develop parallel items simultaneously, only one of which will be eventually adopted. But when you do not have time to go through the procedure on a slow, orderly basis, you have to buy time, and that is an expensive proposition which sometimes becomes necessary. All items do not prove out, of course. That is true under research and development.

TOTAL BUDGET FOR RESEARCH AND DEVELOPMENT

Our total request for 1952, in round figures, is $377.5 million, of which $365 million represents estimated direct research and development costs of the Department of the Army, and the balance of $12.5 million constitutes the fund requirements for a highly classified joint project of the three military services—whose budget is handled by the Army as a matter of bookkeeping expediency—to which I will refer briefly a little later.

Senator O'MAHONEY. What figure would have to be added to this to account for research and development by the other two branches of the Department of Defense?

General MARIS. I just do not recall what the exact figures are for the Air Force and the Navy. The Army figure is only 26 percent of the total being requested in the Department of Defense.

Senator O'MAHONEY. General Moore, will you read into the record the figures you have just shown to me?

General MOORE. For all of the services, the proposed 1952 program, including indirect costs as well as the direct costs of research and development, are: Army $382,000,000; Navy, $519,600,000; and the Air Force, $481,000,000; and Office of the Secretary of Defense, $90,000,000. The total is $1,472,600,000.

Senator O'MAHONEY. You read $382,000,000 for the Army, and the figures given by General Maris are $377.5 million.

General MOORE. And the additional amount over the amount given by General Maris are indirect costs, housekeeping costs incident to research and development.

General MARIS. The indirect costs are not budgeted under this research and development program.

Senator O'MAHONEY. And that difference between these two figures covers all of the indirect costs?

General MOORE. Yes; with some exceptions. For example, I think the pay of military personnel engaged in the activity, who are paid from the Finance Service of the Army, are not broken out and included in that.

Senator O'MAHONEY. The total figure, General Moore, that you have just given us, is $1,472,600,000. That is a very substantial sum. I should like to know, for the record, what production has been derived for all of the services from the expenditures heretofore made, so that we may judge what this new amount will produce.

For example, General Maris said that of the $524,000,000 spent by the Army during the 5-year period, $187,000,000 was expended on the developmennt of items that are now in production. So if we could get some idea or estimate of what the productivity of this expenditure is, I think it would be helpful to the members of the committee.

General MARIS. Plus 300 more which will soon come in.

Senator O'MAHONEY. You would answer for the Army; and General Moore will obtain the figures for all of the services.

(The information referred to is as follows:)

DEPARTMENT OF THE ARMY

The figures for the Army, as provided in the previous testimony, are as follows: During the fiscal years 1946 to 1950 inclusive a total of $524 million was spent by the Army on research and development. Of this amount $187 million was spent on items totaling 320 in number which have already been placed in production.

DEPARTMENT OF THE NAVY

Total expenditures for research and development (direct costs) for fiscal years 1946–50	$1,044,000,000
Total number items placed in production during fiscal year 1951 as a result of the research and development program during fiscal years 1946–50	1,406
Total expenditures for item (b) during fiscal years 1946–50	$309,000,000

In determining the number of items placed in production, only projects resulting in hardware have been counted; projects resulting in new methods and theories, etc., have not been reported. It must be borne in mind that the expenditures reported for fiscal years 1946–50 include expenditures on projects which were completed and placed in production prior to fiscal year 1951.

DEPARTMENT OF THE AIR FORCE

From fiscal year 1946 through fiscal year 1950, the Department of the Air Force and its predecessor organization, the Army Air Corps, expended a total of $673,000,000 for research and development. During that period of time, approximately 2,100 items were standardized and made available for procurement. This represents an expenditure of $350 million out of the total of $673,000,000.

During fiscal year 1951, the Air Force standardized 327 items at an expenditure of $41.3 million and it is anticipated that 425 items will be standardized with an attendant cost of $57 million during fiscal year 1952.

PRIOR YEAR APPROPRIATIONS FOR RESEARCH AND DEVELOPMENT

Senator O'MAHONEY. All right, sir, you may proceed.

General MARIS. In 1950, when we were on a relatively small peacetime basis, the budget totaled $117 million. In 1951 it rose to $310.7

million. This figure of $310.7 million, it will be noted, is $18.9 million greater than the figure of $291.8 million shown in the recapitulation of the technical service budgets on the first page of the budget books before you. This is accounted for by the transfer of $18.9 million, from the Secretary of Defense's reserve fund into the technical service appropriations subsequent to the submission of the budget estimates.

I would like to invite your attention to the fact that the Army received only $0.20 of the research and development dollar appropriated for national defense in 1950 and preceding years following the close of World War II. As a result, we fell far behind and accrued a large deficit in research and development, a situation we are now trying to overcome as fast as additional funds will permit.

Senator O'MAHONEY. How did you incur a deficit?

General MARIS. Because we were unable to keep up with our required program, and the result is that we are now having to spend money, greater amounts of money in all probability than we would have had to spend when the items did not cost so much.

Senator O'MAHONEY. You use the word "deficit" not in the sense of a fiscal deficit, but it is a time deficit?

General MARIS. That is right.

In so doing, we must take into account the optimum in the economic application of these funds, within the necessity of pursuing two or more parallel approaches simultaneously to arrive at satisfactory solutions at the earliest possible date.

With the committee's permission, I shall discuss some of the major project areas of each developing service.

TRANSPORTATION CORPS RESEARCH

The next chart has to do with the Transportation Corps.

The Transportation Corps requirements total $6.3 million as compared with $4.5 million in 1951 and $0.6 million in 1950. The Transportation Corps is modifying commercial type equipment wherever possible to meet military requirements and, where such equipment does not exist, develops special items to fill the needs. The budget presented for 1952 generally will complete the testing and modification of a basic road, rail, and marine fleet for the Army which will permit the Transportation Corps efficiently to move supplies, equipment, and troops to and within any potential theater of operation. Further development is planned on harbor and inland craft capable of negotiating any waterway. Some of these craft will be capable of operating in waterways having a limiting depth of only 1½ feet.

I had hoped to have Colonel Meyer show you some artists' conceptions, of some of the 1952 items involved in this program. He will be here a little later, since he is coming in from Fort Eustis.

With very few exceptions, funds available to the Transportation Corps in fiscal year 1951 have provided for the design of all essential motive power, freight equipment, and railway transportation. Pilot models will be delivered and tested in fiscal year 1952, and then modified as necessary for production. Under design is a fleet of freight cars of cellular laminated plywood which, if its service test in 1952 is as successful as presently indicated, will save nearly 11 tons of steel

per car. To be investigated also in fiscal year 1952 is the torque converter as a replacement for the electric components in Diesel electric locomotives.

ARMY MEDICAL SERVICE RESEARCH

The Army Medical Service research and development program will require $10 million in 1952 as compared with $7 million in 1951 and $3.6 million in 1950. This program is designed to develop better methods of maintaining and restoring the health of troops in order to conserve fighting manpower under all the extreme conditions imposed by war. It must take into account the global operations of ground, airborne and seaborne Army troops in all climates from tropical to frigid, and in environments from jungles, deserts, and mountains to ice-covered Arctic wastelands. It must anticipate hazards which are new to military experience, notably in the fields of atomic, chemical, and biological warfare.

Lieutenant Colonel Ratcliffe is here. Colonel Ratcliffe, do you have with you one of the new burn dressings?

I would like to have you show it to the committee, if you would, please.

Lieutenant Colonel RATCLIFFE. This is a new dressing which is 36 by 22 inches, which is designed to cover a much greater surface of the injured man than the formerly used dressing, which was really only about so big [indicating], so that in the event an individual gets a circumferential burn, to involve the entire torso, we would be able to, even at battalion aid stations, encompass his whole would with this dressing.

It is also designed to be placed around an extremity such as the leg or arm; and it serves the additional function of not only covering the wound, but also of splinting the part, in the event the knee or some other area is also injured, such as a fracture, or something of that sort.

In addition to that, it also serves to absorb all of the exudate that might come from the burn. It has been shown, for instance——

Senator O'MAHONEY. Does that differ from previous dressings in anything but size?

IMPROVED DRESSING APPLICATIONS

Lieutenant Colonel RATCLIFFE. Yes, sir, it differs very radically. It has been found, for instance, experimentally, that if you place a dressing over a wound and the blood or the exudate is allowed to go completely through it so in looking from the outside it is covered with blood, that then becomes a very definitely good culture medium for organisms to grow in, and they go into the wound and the wound becomes infected. So, in order to circumvent that, we have inside this dressing a very highly absorbent layer of cotton, and in addition to that, layers of cellulose which are also absorbent, but the outer six layers of cellulose are definitely repellent to water and other fluid, and also, the outer surface of the dressing is water-repellent. So that no longer is the fluid allowed to come from the wound out to the outside of the dressing.

In addition to that, this being water-repellent, it keeps the water or snow or whatever might be falling on the patient, from going through and contaminating the wound.

So that is definitely an additional feature, in addition to the size.

Senator O'MAHONEY. That is something altogether new; is it not?

Lieutenant Colonel RATCLIFFE. Altogether new; yes, sir.

General MARIS. This has been developed through their research activities through the medical development, and it is one of the small items which we thought might be interesting to you.

Senator O'MAHONEY. I think it illustrates very graphically what improvement has been accomplished.

NEW DRUGS

General MARIS. We have a new drug to replace morphine, and we can explain that.

Lieutenant Colonel RATCLIFFE. This is a new drug made from readily available chemicals, that we have found by experiments both in the United States in Massachusetts General Hospital, and by actual use in the Korean theater, to be just as effective as morphine, milligram for milligram, to relieve pain. That is, where one needs a 10-milligram dose of morphine, one can now use a 10-milligram dose of methadon and get the same pain relief; and this material being exactly similar in its pharmacological action as morphine, and obtainable from readily available chemical sources, eliminates the necessity for the dependence on opium from oversea areas.

So, although we have not actually stocked a great deal of this material, we know we have a drug here that can take the place of morphine, and is readily available.

Senator O'MAHONEY. How was this developed?

Lieutenant Colonel RATCLIFFE. This was actually found as a part of some of the workings of some of the German chemical companies during World War II, when some of the teams the general has mentioned went over some of the findings. And it was originally thought to be only an analgesic, it worked something like aspirin or something of that kind, and it was not known at that time that actually it was just as effective as the potent drug morphine.

Senator O'MAHONEY. What is it made from?

Lieutenant Colonel RATCLIFFE. It is made from nitrils——

Senator O'MAHONEY. That is something new to me.

Lieutenant Colonel RATCLIFFE. Which are commonly available chemicals, and the synthesis can be done in almost any chemical laboratory.

Senator O'MAHONEY. What are nitrils?

Lieutenant Colonel RATCLIFFE. I do not know how else to explain what nitrils are, except that they are commonly available chemicals that can be used. I am not a chemist, myself, and I would not know how to write the formula for them, but it is not necessary to obtain these materials from growing plants, which is a very important thing, and they can be made synthetically.

Senator O'MAHONEY. Are these habit-forming?

Lieutenant Colonel RATCLIFFE. Well, the habit-forming potential has not been thoroughly investigated, but it is our general experience with all similar type drugs that when they produce a feeling of well-being in individuals, that the probability is that they will be habit-forming.

An incidental sidelight on that is, though, that in definite morphine addicts that have been treated at Lexington by the Public Health

Service, addicted to large doses of morphine, if when they come into that institution they are changed from morphine to methadon, they do not know the difference, and they are just as completely satisfied with methadon; and subsequent to that they can be taken off of methadon much faster than if they had been allowed to remain on morphine alone. So that in that regard, it has a very important incidental use.

Senator O'MAHONEY. Where was this developed?

Lieutenant Colonel RATCLIFFE. Most of the work on this was done by Dr. Henry K. Beecher, at the Massachusetts General Hospital; and then he, himself, subsequently took it to Korea and tested it on combat casualties.

Senator O'MAHONEY. Was this a result of Army research and development?

Lieutenant Colonel RATCLIFFE. Yes, sir. The work that Dr. Beecher did at the Massachusetts General was done under our direction, and through our Research and Development Division in the Army Medical Service.

Senator O'MAHONEY. Did he have compensation for that?

Lieutenant Colonel RATCLIFFE. Not himself, personally, sir. The principal investigator in the program is not paid, but he did get money to pay the people that were necessary to perform the job, and he, as the over-all monitor of it, did not receive compensation.

RESEARCH DISCOVERIES PATENTED

Senator O'MAHONEY. Has that been patented?

Lieutenant Colonel RATCLIFFE. No, sir; so far as I know there is no patent on it, excepting perhaps through some of the foreign connections, and I do not know about that.

Senator O'MAHONEY. It is patentable; is it not? Does it belong to the Government?

Lieutenant Colonel RATCLIFFE. At the moment, it does, so far as I know. It was a result of the I. G. Farben investigations in Germany; and through the war clauses during World War II, these materials became available to us.

Senator O'MAHONEY. You have the general rule in all of this research and development, have you not, General Maris, that any new devices or any new practices or methods which are patentable, become the property of the United States?

General SIMON. Sir, we have primarily a system of protecting the United States. All research investigators and workers who are working in a field that may produce patentable ideas are required to keep notebooks, and then they are required to exhibit those notebooks periodically, on the order of once a week or once every 3 weeks, and sign them. And that constitutes what is known as a disclosure, and it is a kind of a temporary protection.

Then, the establishments are monitored periodically, and the patentable ideas are then processed by the United States and patented. They are patented so that the United States receives full protection, even though we may not ever use the things; we patent them so that if you do happen to use them, somebody does not sue you for infringement.

Senator O'MAHONEY. You patent them in what name?

General SIMON. There is a change-over in the policy taking place right now. The old policy was that they were patented in the name of the inventor, and I know I have some patents of that sort; and under a policy such that the inventor received the benefits and royalties of the patent, but the Government had a royalty-free license which it could extend to its contractors.

A change-over is being made in that regard now, and they are being patented in the name of the Government instead of the name of the inventor. And I think that the final consequence of this change-over will be that the inventor will lose any possible benefit he might get out of them. I do not believe that will militate much against our people, however, because most of our inventions are almost exclusively of a governmental character, and the people never actually collect anything, anyway. So I think it is more a nominal thing than a real one.

Senator O'MAHONEY. Are you out of luck, too?

General SIMON. Yes, sir, I have never collected anything.

Senator O'MAHONEY. When we are asked to appropriate one-billion-four-hundred million-odd dollars for research and development, it is only proper that the inventions which come as a result of that appropriation should be in the public domain and should be patented by the Government of the United States.

When will this change-over be complete?

General SIMON. It has been directed now, I think, and it is just a matter of issuing all of the formal orders, because the last invention that came to my notice, which was made, was processed in the name of the Government and not in the name of the inventors.

Senator O'MAHONEY. I think a system of incentives to reward those who do produce good ideas is highly proper, and should be maintained.

General SIMON. There is a system of rewarding not only for the inventions, but even suggestions; and a definite order is put out on that which describes even the extent of the reward. I cannot remember it, but it is small.

Senator O'MAHONEY. Let us have a statement for the record on that, and it can be prepared later.

General SIMON. All right, sir.

(The information referred to is as follows:)

PATENT POLICIES

Research contracts with industry.—The Army, Navy, and Air Forces employ the same regulations prescribing patent procedures in contracting with industry for research and development (section IX, Armed Services Procurement Regulations). It is the general policy of the Departments to acquire only license rights under inventions made in performance of a contract. Should title be required, as for the purpose of secrecy, the cost of the project would be increased. Title to inventions is obtained where the major portion of the work is to be done in Government-operated laboratories and with Government-furnished equipment.

In all research contracts the Government obtains the right to reproduce, use, and disclose for Government purposes, including the right to give to foreign governments, all reports, drawings, blueprints, data, and technical information.

The end item of any research project may involve background patents owned by the contractor or others. Such patents constitute private property which cannot be taken without just compensation. In many instances contractors, especially the larger ones, give the Government a free license under their patents.

Research contracts are awarded to concerns selected because of their back-

ground knowledge of the problem, past experience, and ability and capacity to deliver. Different concerns may be engaged on the same or difference aspects of a problem.

RESEARCH CONTRACTS WITH RESEARCH AND EDUCATIONAL INSTITUTIONS

The regulations applicable to industry are likewise applicable to research and educational institutions. Where this type of contractor does not seek patent protection for its research projects the Government acquires title. The colleges and universities are very patent conscious and usually retain title to inventions in order to produce royalty income to underwrite their general-research programs.

Government employees.—Executive Order 10096 dated January 27, 1950, requires that inventions made by research employees of the Government be assigned to the Government. This order is administered by the Chairman of the Government Patents Board functioning directly under the President.

Foreign aid.—The patent laws of the United States are effective only in the territorial limits of this country. Information furnished to foreign nations is released with the understanding that no license is conveyed and the recipient manufactures at his own risk subject to the patent laws of the recipient nation. On items which have been standardized for use by other countries manufacturing drawings are released but on other items only general principles and military characteristics are furnished.

Export by private manufacturers.—Military items cannot be exported by private persons without approval of the Department of State which seeks the recommendations of the Department of Defense. Items which have been developed for the United States by private contractors are under effective control as to export. Where a foreign nation is producing an item that has been standardized the Department of the Army approves coordination between the foreign manufacturer and the United States manufacturer or research contractor.

RESEARCH ACCOMPLISHMENTS IN MEDICINE

General MARIS. The Medical Corps has one item of considerable interest, which you might show to the Senator.

Lieutenant Colonel RATCLIFFE. This is called the intramedullary pin, the idea for which was originally developed in Germany. "Intramedullary" means that it is inserted in the cavity of the bone, and this is the pin that is used for the femur, which is the large bone of the thigh. And assuming an individual has a fracture across the center of the thigh bone, it is simply inserted through the top of the bone right down through the marrow cavity of the bone, and through the two fractured ends of the bone, and then on down to the distal or the far end of the bone, and thereby gives an artificial stability to the bone and permits the fractured ends to come close together.

Senator O'MAHONEY. What effect does it have on the marrow?

Lieutenant Colonel RATCLIFFE. It actually, at the time of insertion, destroys the marrow, but that marrow in the adult is not the type that produces blood cells, and it is therefore not of great importance to the individual. And when it is subsequently pulled out as is done when the fracture has healed, the marrow then returns, in many instances.

The important features of this are (1) that it lends enough stability to the fracture so that the individual is able to move the part around and no longer necessitates a cast; and, as you know, when a man is placed in a cast for a long period of time, the muscles become atrophied or lose their function, and the joints become stiff, so that in allowing the individual to walk about on this and to move it more quickly, his actual hospital stay is materially reduced.

In addition to that, one of the things that makes fractures heal well is to actually put pressure on the two parts of the broken bone, and that pressure actually stimulates healing. And because of this pres-

sure, the time of healing is also decreased, in addition to not having a long period of time in the hospital to restore the muscles and joints.

Senator O'MAHONEY. What is that made of?

Lieutenant Colonel RATCLIFFE. It is made of stainless steel.

Senator O'MAHONEY. What is the new idea about that?

Lieutenant Colonel RATCLIFFE. The new idea is, of course, that before the use of this, fractures were simply put up in traction to pull the two parts of bones together, and then subsequently encasing the part with a plaster-of-paris cast so that it no longer could be jostled out of place; and this new method keeps it in place almost permanently without a cast.

Senator O'MAHONEY. So the new idea here is merely an insertion through the marrow cavity, of the stainless steel rod?

Lieutenant Colonel RATCLIFFE. That is right, sir.

Senator O'MAHONEY. And, of course, there is another one for the smaller bones of the forearm?

Lieutenant Colonel RATCLIFFE. Yes, sir.

General MARIS. Those are just small samples, and we thought you might be interested in them.

INCREASED FUNDS REQUESTED

Increased funds sought in 1952 will provide for continued research at increased tempo in such important areas as treatment of flame and flash burns, promotion of healing and control of infections in battle wounds, the development of a blood plasma substitute, the proper treatment of radiation casualties, work in the fields of human engineering and environmental factors in disease and injury, stress studies, and many others. Of special importance is its research in the field of prosthetic equipment for amputees.

Major work will be in fields not covered by civilian research and development. For example, a number of diseases, rare in the United States, are prevalent not only in the Far East where we are now fighting, but also in other parts of the world where we must be prepared to fight. The Army must do research work on their prevention and cure or this research will not be performed. Specific examples of such diseases are schistosomiasis, amebic dysentery, shigella dysentery, dengue fever, and bubonic plague. Certain other diseases are peculiar to Africa or the Middle East, but virtually absent in the United States; among them: Yellow fever, sleeping sickness and phlebotomus fever (sandfly fever). The study of these and many other areas are included in the Army Medical Service research and development budget.

QUARTERMASTER CORPS RESEARCH

Requirements under the appropriation "Quartermaster Service, Army," total $15.3 million as compared with $13.2 million for 1951 and $8.3 million for 1950. Of the amount requested for 1952, $9.2 million is provided to finance Quartermaster Corps research and development responsibilities; $5.1 million for support of the Army-wide research program under the supervision of the Research and Development Division of the General Staff; and approximately $1 million is required for the personnel research program of The Adjutant General. The bulk of the total appropriation increase for 1952 will

provide for program acceleration within the over-all objective of the Quartermaster Corps to increase the effectiveness of our troops anywhere in the world through improvement of their food, clothing, shelter, and personal equipment, as well as improvement in the methods of packaging, handling, and delivery of those supplies.

The Quartermaster is engaged in a wide research and development program to fulfill this mission. The comparative palatability and nutrition of foods and potential ration components is under constant study. Strength, durability, and insulating qualities of many types of clothing for all climates and seasons must be tested and new cloths developed. Economical but adequate field shelters must be provided. All of these items must be developed with a view to satisfactory perfromance under climatic extremes and operational stresses seldom encountered in civilian usage.

RESEARCH ACCOMPLISHMENTS

A few recent accomplishments of the Quartermaster Corps Research and Development Branch are well worth mentioning. They have developed an Arctic trail ration now under test which is proving to be the most nutritious food per unit of weight which is palatable to human beings. New special ration supplements for hospital and aid stations have also been developed, as well as a completely synthetic pepper. Others include a new helmet which is lighter in weight and provides a greater degree of protection to our troops; and improved gasoline-dispensing equipment.

Mr. Mockabee, do you have some examples there of packaging, and some other things that have been developed?

Mr. MOCKABEE. Perhaps the chairman will find this plastic helmet of interest. The new helmet liner, which is used with an aluminum outer shell will replace the standard M–1 steel helmet that is familiar to you.

The liner itself imparts about 50 percent more ballistic protection, as well as additional coverage. You can see that the V–50 missiles, under test, have not actually penetrated, and it provides greater area protection to a man's head.

Senator O'MAHONEY. This particular helmet has been tested? Under what circumstances?

Mr. MOCKABEE. The test employs V–50 pellets which are fired into the helmet. General Simon could tell you more about the ballistics tests that that helmet receives. The pellets are still in the helmet.

General SIMON. I am sorry, I was writing a note at that moment.

Senator O'MAHONEY. Do I understand that they were fired into the helmet?

General SIMON. We conduct firing tests on those helmets. That is developed by the Quartermaster, but we conduct the firing tests.

Senator O'MAHONEY. At what distance?

General SIMON. That one right there, I cannot recognize that. I was not there at the proving ground when it was done, and I do not know the details of the particular test.

Senator O'MAHONEY. Do you know the details of any such test?

General SIMON. I know the details of a great many tests, but not this particular one, sir.

Senator O'MAHONEY. Any test on a helmet.

There is presented to the committee a helmet at which apparently bullets or pellets, as the witness says, were shot, and they have not actually penetrated the helmet, and that is of great interest; particularly, however, if we know the range at which the shooting took place.

Mr. MOCKABEE. This uses the VE–50 pellet fired at 1,129 foot-second velocity.

General SIMON. Yes, sir, I can answer.

At ballistic research laboratories, we have developed purely artificial shells for the purpose of tests, and it saves enormous time and expense in testing. When an artillery shell bursts, it makes random-sized fragments, and they may vary from the size of almost, say, the head of a black-headed pin, up to a size larger than a dollar.

We have developed a shell which produces specific sizes of fragments, and I think that this one is one of the smaller fragments, probably about 700-gram fragments, and we make a shell that will produce just the fragments of a certain size at a certain velocity.

Now, if you know what will happen with fragments of certain sizes and certain velocities, it takes a family of 16 shells, then you can predict what will happen for various types of artillery shells. And so, this is an artificial type test, but if this holds back this fragment here, which is called a V-50, that is just an artificial classification, which is going at 1,129 foot-seconds, then they can predict the percentage of fragments that will be kept out.

You never hope to keep all of them out, and you try to get something that will keep out, say, 97 percent of the fragments, because if you tried to make it keep all fragments out, it would be so heavy the soldier could not carry it.

And so, that has been subjected to one of these carefully devised scientific tests, to make a thing which will be an optimum that will keep out the most possible fragments for a weight that the soldier can carry without undue fatigue.

Senator O'MAHONEY. Would it seem to you, from an examination of this exhibit, that it would keep out 90 percent of the fragments?

General SIMON. I do not know, sir, whether it would be 90 or 95, because the criteria is set up for it. But apparently it has passed the test.

Senator O'MAHONEY. So if it has passed the test, it would mean it would keep out at least 90 percent of the fragments?

General SIMON. It would meet this optimum value, yes, sir.

Senator O'MAHONEY. That is something altogether new, is it not?

General SIMON. This is altogether new. The one we used in World War II was the steel shell. This new one is much lighter.

Senator O'MAHONEY. Is the advantage of this in its lightness, rather than in its impenetrability?

Mr. MOCKABEE. For the same degree of protection it is about 50 percent less weight, but actually, the new assembly and the old assembly weigh about the same, 48 ounces. However, you can get greater ballistic protection and greater head coverage with this one.

Senator O'MAHONEY. So it is a better helmet, and it affords better protection to the soldier?

Mr. MOCKABEE. Very definitely.

General MARIS. And decreases the weight on his head.

ARCTIC PATROL RATION

Mr. MOCKABEE. Another item of interest is this Arctic patrol ration. Feeding troops in the Arctic is a very difficult problem. Many scientists and explorers have found pemmican to be a very satisfactory diet while on the Arctic trail; while man, stimulated by exploration in the interest of science, is satisfied with a ration for it's nutritional value alone, military rations must incorporate acceptability, few men will accept pemmican.

This new ration is the most nutritious palatable foodstuff that is known to man. It has about 5,300 calories in about 50 ounces of weight.

Senator O'MAHONEY. This is sufficient for one man for 1 day?

Mr. MOCKABEE. Yes.

Senator O'MAHONEY. And each package carries a plastic spoon or two or three?

Mr. MOCKABEE. That is right. It is sufficient for 1 day, and it may be eaten either hot or cold; and naturally, it is more acceptable if it is eaten hot. There is included dehydrated meat bars, for example, and they may be eaten as a bar or may be made into a hash.

Senator O'MAHONEY. There is soup mix with chicken; that is pretty good for the Arctic.

Mr. MOCKABEE. That is right.

Senator O'MAHONEY. It is 1 o'clock. We will recess until 2:30 this afternoon.

AFTERNOON SESSION

The hearing reconvened at 2:30 p. m., upon the expiration of the recess.

Senator O'MAHONEY. Come to order, please.

General Maris, we will be glad to have you proceed.

RESEARCH AND DEVELOPMENTS OF FOODS

General MARIS. Mr. Chairman and gentlemen, continuing with the middle of page 8 of my statement, the Quartermaster is engaged in a wide research and development program to fulfill this mission.

The comparative palatability and nutrition of foods and potential ration components is under constant study. Strengths, durability, and insulating qualities of many types of clothing for all climates and seasons must be tested and new cloths developed.

Economical but adequate field shelters must be provided.

All of these items must be developed with a view to satisfactory performance under climatic extremes and operational stresses seldom encountered in civilian usage.

A few recent accomplishments of the Quartermaster Corps Research and Development Branch are well worth mentioning. They have developed an Arctic trail ration now under test which is proving to be the most nutritious food per unit of weight which is palatable to human beings.

New special ration supplements for hospital and aid stations have also been developed, as well as a completely synthetic pepper. Others include a new helmet which is lighter in weight and provides a greater

degree of protection to our troops, and improved gasoline dispensing equipment.

EQUIPMENT RESEARCH

Mr. Mockabee has a sample of a new air drop gasoline container for free drop. It holds 5 gallons.

Mr. MOCKABEE. This container utilizes a flying saucer principle. It weighs 3 pounds 8 ounces, holds 5 gallons of gasoline, and has been successfully dropped from 2,000-foot altitudes.

Senator O'MAHONEY. How many gallons will it hold when filled?

Mr. MOCKABEE. Five gallons.

Senator O'MAHONEY. How large is it then?

Mr. MOCKABEE. It inflates.

Senator O'MAHONEY. To what extent?

Mr. MOCKABEE. About 6 inches on either side.

Senator O'MAHONEY. What do you mean by saying it employs the flying-saucer principle?

Mr. MOCKABEE. Just the shape. When thrown out of a plane it falls and actually bounces about 4 to 8 feet when it strikes the earth.

Senator O'MAHONEY. What is it made up of?

Mr. MOCKABEE. Rubber compound reinforced with nylon.

Senator O'MAHONEY. The nylon is reinforced?

Mr. MOCKABEE. The rubber is reinforced with nylon.

Senator O'MAHONEY. Is it synthetic rubber?

Mr. MOCKABEE. Yes.

SYNTHETIC RESEARCH

General MARIS. The Quartermaster is also charged with the overall coordination of research in the field of elastomers and carriers out all materials research in the field of natural and synthetic rubber. The performance of rubber items under Arctic conditions has been found to be unsatisfactory. Molded rubber articles, such as gaskets for food containers, weather seals for shelters, and respirator masks, became extremely stiff and brittle.

Similarly, rubber-coated fabrics used in ground cloths, covers for weapons, waterproof clothing, and sleeping pads, stiffen and crack at low temperatures. Research and development work under the jurisdiction of the Quartermaster Corps has succeeded already in making rubber serviceable at temperatures as low as minus 50° Fahrenheit, but further work is necessary to reach the goal of serviceability at minus 65° Fahrenheit.

The Army-wide portion of this budget includes research programs in fields outside the areas of weapons and equipment. Funds for these activities are included in the Quartermaster budget as a matter of fiscal convenience and have no relation to the Quartermaster requirements.

OPERATIONS RESEARCH OFFICE, ARMY

Among them is the Operations Research Office, the Army contracting agency of Johns Hopkins University, whose activities are under the direct supervision of my office; the Research and Development Division, G–4.

The mission of the Operations Research Office is to analyze warfare scientifically, quantitatively, and qualitatively, and to develop

facts which will lead to improvement of strategy, tactics, logistics, weapons, and weapon systems on the most economical basis consistent with combat requirements.

Certainly there is no better place to ascertain and evaluate battlefield requirements than in battle, so shortly after the inception of hostilities, Operations Research Office sent a group of trained scientists and analysts to Korea to examine the combat facts while they were still hot. We wanted facts on such things as tactical air support, performance of our new Patton tank, efficiency of other new weapons and munitions; what were the tactics being employed by enemy and what influence should they exert on our weapons development and on our training methods.

JOINT TASK FORCE STUDIES

In addition to Operations Research Office, we are participating with other services in joint task force studies by the best scientific talent in the country, under the sponsorship of such highly qualified institutions as California Institute of Technology, and Massachusetts Institute of Technology. They are now making special studies in areas of vital interest to all of us involving techniques, equipment, and weapons systems employed in combat to assist us in finding solutions to gaps and deficiencies in our program.

RESEARCH ON PERSONNEL OPERATIONS

The personnel research and development program of the Adjutant General is also included in the Quartermaster budget.

In these days of critical manpower shortages, increased emphasis is required in the personnel operations field to develop the best possible techniques for the initial selection of personnel for the military service and for their classification thereafter for appropriate assignments which will result in maximum benefit to the service and the Nation as well as to themselves.

It also includes the evaluation of efficiency, and the selection of personnel for positions of leadership and responsibility.

The scope of this program also includes the training, logistical and medical aspects of personnel operations. Considerable emphasis is planned on the entire field of human resources research.

ENGINEER CORPS RESEARCH

The Corps of Engineers 1952 research and development budget is $170 million as compared with $16.2 million in 1951, and $5.9 million in 1950. Major items included in this budget are research and development projects in the fields of mine warfare, night fighting, demolition, bridging, and stream crossing.

This program is designed to provide for consolidation of gains under specific projects achieved in 1951, for the continuation of projects which show considerable promise of success, and for the expedited testing of certain experimental models.

You might be interested in seeing this new mine detector which the Engineers have.

Senator O'MAHONEY. Yes, we would.

(Discussion off the record.)

ARCTIC AND DESERT TESTING

General MARIS. Provision is also made in this budget for arctic testing at Fort Churchill, Canada, and desert testing at Yuma, Ariz., of equipment and methods under climatic extremes.

I might add that funds are included in the budgets of the other technical services for similar testing.

Extensive research is planned in infra-red equipment with a view to improving materials and designs, increasing range and image clearance, increasing ruggedness and reducing the complexity and weight of equipment in order to get better field performance in front-line combat at night, or under other conditions of low visibility.

Senator FERGUSON. You have your own department making this research, or are you farming it out?

General MARIS. The Engineer Corps does some in their laboratory and some on contract.

Senator FERGUSON. What percentage is in Government laboratories, and what is on contract?

Colonel HAMMOND. That varies with the stage in which the particular project happens to be. Normally at the beginning to come up with the ideas, it will be very largely in our own laboratories.

As it begins to get into the hardware state, and we want to put a design together to test it so we will know whether it will work, or not, and particularly to see that we have a producible item, we put it out on contract to some firm.

Senator FERGUSON. That mine detector, is that in your own shop?

Colonel HAMMOND. That started in our own shop. When we became convinced the design was good, then we let a contract for developmental models of it which were made by a commercial concern. The testing was done by us. The tests proved to be successful and it is out in quantity now to General Electric which has the first contract.

There are two additional contracts now with other contractors.

RESEARCH GRANTS TO EDUCATIONAL INSTITUTIONS

General MARIS. In addition to that, the Ordnance probably has more work performed on the outside than anyone else.

General SIMON. Out of the $242 million for next year, we will put five-sixths of that in outside institutions.

Senator FERGUSON. Of that money?

General SIMON. Yes, because a larger amount of the money goes particularly for making expensive models. It does not go to scientists, but it goes to machine shops, to foundries for casting the experimental hulls of tanks, although we put a lot of our scientific work on contract too, in spite of having eleven arsenal laboratories.

We put it with the educational institutions and industrial laboratories.

Senator FERGUSON. Do you farm out much of your basic research?

General SIMON. Yes. In fact, our policy is not to do within Government anything that we can get done normally outside. Things like ballistics nobody is going to do but the Government. If we need some phase of mathematics in order to improve our firing and bombing tables, we will place that with a good academic institution rather than do it ourselves, because there is a counterpart in civilian educational institutions.

The fewer things you have to do for yourself, the better you can concentrate on your specialized work.

General MARIS. Supporting research on industrial engines will also be continued with the objective of determining those engines which can be manufactured by industry with the minimum number of major changes in tooling, and selecting engines with parts that will be interchangeable between those of a given size from all civilian industrial sources.

For example, while in World War II these were 126 different sizes and types of pistons required for industrial engines used by the Army, our new program is designed to reduce this number to 10 sizes and types of pistons. Similar reductions in numbers of other fast-wearing parts of engine equipment is a goal of this program.

CHEMICAL CORPS RESEARCH

Funds included for the Chemical Corps amount to $24.7 million required to carry out its primary responsibility for the entire Department of Defense of research and development in the fields of chemical, biological, and radiological warfare. This is approximately the same amount as was appropriated for 1951.

In 1950, only $12.4 million was made available for work in these fields.

(Discussion off the record.)

SIGNAL CORPS RESEARCH

The Signal Corps itself will require $48.6 million to carry out its research and development requirement during the coming fiscal years, as compared to $47.8 and $21.8 million in the 2 preceding years.

Also included in the Signal Service of the Army 1952 budget is an item of $680,000 for a classified special field activity of the Army, and $12.4 million for special special field activities which is a classified joint project of the Department of Defense.

Therefore, the total appropriation requirement amounts to $61.7 million, representing a slight increase over the comparable budget for 1951.

Senator O'MAHONEY. Would you give us an idea of how many devices have been produced by the Signal Corps as a result of the expenditure of $69.6 million in the two preceding years?

General MARIS. Colonel Brown, will you give a brief description of the communication systems that are being developed?

RESEARCH ACCOMPLISHMENTS

Colonel BROWN. I think the best example of what we have produced with the money given us in the past is what we have placed in production this year that was in development in previous years. The total is about 80 items.

Included in those items have been a goodly number of items in the tactical wire system.

(Discussion off the record.)

In the radiological field we have placed into production some radiological survey instruments which would be used by a survey party to

go around an area which had been subjected to an atomic bombing.

We are placing in production dosimeters of a self-developing type which will be used by an individual soldier and which will tell whether he has been exposed to atomic type radiation in the area which is bombed.

Senator O'MAHONEY. We have seen the 22-pound walkie-talkie which is so much better than the old 44-pound walkie-talkie that a man has to carry.

We have seen the instrument which was described as being used in connection with the bazookas for sighting objects. That also was carried by a man.

Do you have any additional items of that kind which the soldier himself carry in addition to his ordinary housekeeping?

PORTABLE RADIO COMMUNICATIONS

Colonel BROWN. Mostly in our line of work the things that a soldier carries are related primarily to the communications field. There is the little handy-talkie radio set which is just about so long, which the soldier would carry.

Senator O'MAHONEY. How much does that weigh?

Colonel BROWN. That weighs about 6 pounds with its batteries in it. It is the type he holds up to his ear.

Senator FERGUSON. How far can he communicate?

Colonel BROWN. It has a range of approximately 1 mile under normal conditions.

Senator O'MAHONEY. What is the power plant? What is the length of life of the power plant of these walkie-talkies?

Colonel BROWN. The batteries that will be used in those will give a life of approximately 24 hours actual operation.

Senator O'MAHONEY. They may be shut off?

Colonel BROWN. If they are shut off, that takes the power off. Normally, in tactical use of communications equipment of this type if you are in combat, then the battery is on, at least the receiving portion is on, all the time.

You are not transmitting all the time, but at least you have the receiver portion on.

Senator O'MAHONEY. So you have to have batteries to replace the power plant?

Colonel BROWN. Battery supplies are a very great problem in equipment of this type.

I might mention that over the past 4 years we have managed to increase the capacity of the type of dry batteries involved by double what they were at the end of the past year, and in so doing, we have just about halved the cost of a certain amount of battery capacity. We still have development work going on in that field which indicates that over the next 2 or 3 years we can have half the cost and double the capacity again.

Senator O'MAHONEY. That is very interesting because most of these advances in warfare are also advances in cost.

Thank you very much, sir.

RADIO, ELECTRONIC, AND GUIDED MISSILES RESEARCH

General MARIS. These funds are required for essential research and development by the Signal Corps in the fields of radio and wire communications including radio direction finders, radar, meteorological instrumentation, guided missiles instrumentation, and electronic countermeasures.

The latter two were not mentioned by Colonel Brown.

Approximately 40 percent of the funds included for the Signal Corps will be spent on research and development in the field of guided missiles, ground radar, radio and wire communications. A total of 31 new Signal Corps developmental items are expected to reach service testing in fiscal year 1952, which will improve combat effectiveness materially.

In this connection, the Signal Corps will continue its miniaturization program of electronic components, its planned integrated program of new communications items for all units which eventually will permit voice communication from great distances to the commanders of front-line units.

Senator O'MAHONEY. What do you mean by the miniaturization program?

General MARIS. The miniaturization of the components of the various items. That is what makes possible the reduction in size and weight of the items.

For instance, the printed circuit alone developed in the Signal Corps laboratory which is now being used by industry was a tremendous advance along those lines.

Finally, the program includes some basic research in field of electronics.

ORDNANCE CORPS RESEARCH

For the Ordnance Corps we are asking $242.0 million for 1952, as compared with $185.3 million for 1951, and $56 million for 1950.

A large proportion of this increase in 1952 over 1951 will be devoted to research and development in the initially costly field of guided missiles.

The Ordnance Corps is developing surface-to-surface missiles capable of carrying both atomic and conventional warheads for tactical employments. In its surface-to-air program, it is developing missiles which will greatly enhance the ability of our ground forces not only to destroy enemy aircraft, but to do so at ranges and altitudes far beyond those now reached by conventional antiaircraft artillery.

When developed and supplied to our field forces, these two families of missiles will provide our commanders with powerful weapons available for instant employment at all times, under all conditions of weather.

(Discussion off the record.)

Senator O'MAHONEY. We have gotten a little afield of the original question which I asked, and which had to do with plain dollars and cents.

Let us say that if by reason of this appropriation an implement of warfare, which we will call "X," were developed in a private laboratory, subsidized out of this appropriation. Could that laboratory then obtain a patent on it?

General SIMON. No, sir.

Senator O'MAHONEY. It could not?

General SIMON. It belongs to the United States.

Senator O'MAHONEY. And in the manufacture of the implement "X" from here on out the United States is free to make a contract with any producer without any charge for the patent?

General SIMON. That is correct, sir.

Senator FERGUSON. May I ask you this, then: They could take it from Westinghouse and give it to General Electric?

General SIMON. That is correct. We do that right along.

MANUFACTURE OF UNITED STATES MILITARY ITEMS BY ATLANTIC TREATY COUNTRIES

Senator O'MAHONEY. Now then, with respect to the question asked by Senator Ferguson, or its implications, at least, suppose that under the MDAP we have developed a very successful weapon of warfare and that we make that available to one of our allies. It is patented by us. That ally would then be able to manufacture it and possibly sell it.

General SIMON. That is the second point I want to come to, Mr. Chairman. That is, that it takes a kind of industrial know-how. You can give anybody all the drawings in the world and they will have an awful time making it.

Senator FERGUSON. That is what we thought about the atomic bomb, and that was one of the excuses for not guarding it so secretly, that is, that Russia would never get the know-how, but we are told that they got the know-how and exploded a bomb.

General SIMON. But it is easier to talk to the manufacturer and get that. The United States, when it makes an agreement with a foreign country, says, "We will use our good offices to introduce you to the manufacturer so as to encourage him to do this thing, but we know that we can't force the manufacturer to take you into his plant and give you all of the details."

Senator O'MAHONEY. What I am getting at is this: To what extent are we under any obligation to make available to manufacturers in another country, where we have no control, an implement of warfare which is wholly the result of the expenditure of public funds belonging to the United States? Are we under any obligation to make that available?

General SIMON. To make that available?

Senator O'MAHONEY. I note that one of the officers shakes his head negatively.

General SIMON. If we give a thing for what we call indigenous manufacture to another country, we give that country all of the blueprints.

Senator O'MAHONEY. If we do it. But I am trying to find out whether we are under any obligation to that with respect to these highly secret things we are talking about here.

General SIMON. Well, we have not done so, sir, so far as I know.

Senator O'MAHONEY. But are we under any obligation to do so. That is what I want to know.

General REEDER. May I answer that question, sir? We are not under any obligation. We make the decision.

Senator O'MAHONEY. I wanted to bring that out, because it seems to me that the inference from General Simon's testimony was clear that, as a matter of course, such a thing might happen, but that there is no reason why it should happen.

General REEDER. We make the decision as to whether the thing will be given to the manufacturers or not.

General SIMON. On an item-by-item basis.

Senator YOUNG. Do these countries we deal with in Europe have a similar policy with respect to us?

General REEDER. I shouldn't be surprised. They don't tell us their policies, any more than we tell them ours.

Senator YOUNG. Are they as free in giving us their information as we are in giving them ours?

General REEDER. Yes, I think they are, and possibly more so. We have a little more to give, at the moment, than they.

Senator FERGUSON. Mr. Chairman, are we trying to standardize weapons in the Atlantic Pact?

General REEDER. Within reason, yes, sir. That started out with a far too rigid attempt at standardization, which was delaying the arming and the utilization of overseas production.

(Discussion off the record.)

Senator O'MAHONEY. Well, General Maris, will you proceed, please?

TANK AND AUTOMOTIVE DEVELOPMENT

General MARIS. Sizeable amounts are also included in the Ordnance budget for the development of automotive and combat vehicles, new families of both Field and AA artillery, new ammunitions of all kinds, cannon and recoil mechanisms, grenades, mines, fuses and warheads. In the tank field, particularly, we are concentrating on the development of improvements to our family of tanks, in fire power, armor, fire control, and power trains.

I might add that in the period since the last war we have spent the greater part of our efforts in the development components of tanks, because of the expense of developing tanks themselves, so that when the time came to build up a new family, the motors, that is, the engines, the transmissions and the other component parts had been developed, so that they could be put together to form these new families of tanks.

Our counter armor program is placing optimum emphasis on the problem of defeating hostile armor cheaply as well as effectively.

The results of that program will be made available to the infantryman, to the artilleryman, the tankers and to all elements along the line in our Army, who will have weapons with which they can defeat hostile armor.

Senator FERGUSON. Do the tanks have machine guns on them?

General MARIS. Yes, sir.

Colonel THORLIN. They have two coaxial machine guns, and one machine gun on top of the turret.

Senator FERGUSON. So that they are capable of all-around coverage?

Colonel THORLIN. Yes, sir. The Ordnance Corps carries the weight of the Army's research and development effort in all of these important fields, which have such a direct bearing upon the effectiveness of our Ground Forces in land combat. The 66 percent of our budget which is allocated to the Ordnance Corps is consistent with

the major combat role which must be assumed by ground troops in any war of the foreseeable future.

General SIMON. Since the ordnance program is such a large one, we would be a long time going into it.

NEW ORDNANCE MATÉRIEL

I would like to point how much we are getting in the way of new Ordance matériel.

This is my bimonthly summary of new important items to be completed. It consists of 20 pages with approximately 40 items to the page.

I believe that if you will look down this—20 times 40 is approximately 800—you would find that approximately two-thirds of these are coming to completion within this coming fiscal year. You would find that approximately one-third of them have been completed during the past fiscal year. A large number of the ammunition items were completed during the first half of that fiscal year. We completed some 46 new ammunition items.

Now, a number of these items carry asterisks. Off the record, I will say this—

(Discussion off the record.)

Senator FERGUSON. All right, you may proceed, General.

General MARIS. Throughout our development program there is constant awareness on the part of each of our technical services that the fulfillment of requirements for both defense and civilian needs already has put a heavy strain on the available supply of a number of strategic and critical materials. Consequently, our efforts are continually directed toward rigid economy in the use of such key materials in the development of prototype equipment, and toward intensive basic research designed to produce substitute or alternate materials for those items in tight or very short supply. For example, research is under way to obtain suitable substitutes for nylon, leather, wool and certain steel alloys.

The financial requirements to support the technical service programs just enumerated have been repeatedly subjected to exhaustive review from both the technical and fiscal standpoints at each stage of the budget cycle. These reviews have included not only the usual thorough internal appraisal by each technical service, but also a complete analysis and review by the Army Research and Development Review Board, the membership of which includes representatives from Headquarters of the Army Field Forces, the General Staff, and the office of the Under Secretary of the Army. In addition, reviews have been made by three successive ad hoc committees appointed by the chairman of the Research and Development Board. These committees, operating under the directive of the Secretary of Defense, were comprised of civilian scientific and industrial experts of high repute.

The technical service budgets now before you are broken down by object class in accordance with established budgetary procedure.

I would like to depart from this pattern briefly and reconstruct the program for you by operational categories, as established by the Research and Development Board, and by technical objectives within

two of those categories. I thought you would be particularly interested in what we propose to spend for research and development in vital areas on such items as guided missiles, guns and other munitions.

OPERATIONAL CATEGORIES, RESEARCH AND DEVELOPMENT

The operational categories, as set forth in the master plan of the Research and Development Board, which is issued by the Board, in order to coordinate all research and development in all three of the research services, are: Land combat; air defense; supporting research; personnel operations; supply and maintenance operations; chemical warfare; intelligence operations; atomic warfare; airborne landing; basic research; amphibious operations; strategic air operations; psychological and cold war operations; antisubmarine operations; combat air operations; sea combat operations.

LAND COMBAT, AIR DEFENSE AND SUPPORTING RESEARCH

The three largest of these categories are land combat, air defense and supporting research, which together represent 70 percent of the total 1952 budget.

Land combat is the Army's largest category, in terms of need, dollars, and land-combat accomplishment. It includes surface-to-surface guided missiles, new guns, tanks, combat motor-vehicles, rocket launchers, ammunition of many kinds, and all other weapons and equipment used by ground troops to neutralize or destroy enemy forces and to seize control of land areas. I have already enumerated some of the items we plan to develop in these areas with the funds we are requesting.

In the air-defense category, we are requesting a considerable sum in order that we may continue the present rate of progress on surface-to-air guided missiles, improve the capabilities of our World War II anti-aircraft methods and weapons, and develop new and better anti-aircraft weapons.

The purpose of supporting research is the solution of broad problems which are not confined to any particular operational category, but which support specific objectives under two or more separate categories of research and development.

For example, the successful development of both guided missiles and rockets which are included in both land combat and air defense, depends on supporting research in the fields of propulsion and guidance systems and on parallel development of adequate testing equipment and techniques, such as electronic and photographic instrumentation for accurately tracking the missiles and obtaining performance data during flight. The development of such instrumentation comes within the scope of supporting research.

Earlier I indicated to you in general how our program was built up, reviewed, and approved. Throughout the process of formulation and review the program retains the operational pattern which I have just outlined to you. It is this program which, when finally completed, is broken down in total amount into the conventional type budget in your hands, as required for the legislative processes of Congress.

I would like to call attention to the fact that the $365 million requested for direct Army research and development costs amounts

to only 26 percent of the total research and development budget of the Department of Defense, and represents only 2 percent of the total Army budget. The latter figure may be compared with the 2 to 4 percent usually allotted to research and development by forward-looking industry. We submit that the Army is one of the most forward-looking industries, and, as such, we commend the Army research and development budget to your favorable consideration.

That, gentlemen, concludes my statement.

RESEARCH ON SUBSTITUTES FOR MATERIALS IN SHORT SUPPLY

Senator O'MAHONEY. On returning to the room, I observe, General on page 14 of your prepared statement the statement that—

> research is under way to obtain suitable substitutes for nylon, leather, wool and certain steel alloys.

What is the substitute for nylon? Who is working on that?

Lieutenant Colonel BROWN. One of the big problems in the nylon field right now is in the production of the type of field wire that we are using in Korea. We use a nylon coating on the outside of the wire.

Now, we and some other people have taken so much nylon of this particular type for that insulation that nylon in that form has now become a critical material.

If we had to go into full-scale production on field wire for mobilization, we would not have enough of this particular type of nylon to do so.

Now, there is one possible substitute for this, which happens to be another nylon compound which is made in such a way that the supply of it, if it will work for what we need it for, would not be critical.

Our people are also working on other approaches to that.

Senator O'MAHONEY. Is that another synthetic fiber, the substitute for nylon?

Lieutenant Colonel BROWN. One of the substitutes is another form of nylon other than the one which is the critical item right now—it isn't a cloth-like type.

Senator O'MAHONEY. What form does the research take?

Lieutenant Colonel BROWN. When you are looking for substitutes for any type of material of that nature, your research is experimentation into all of the different types of other synthetics, which you might use for that same purpose. Also you get basically into the structure of these various compounds and look for possible different ways in which they can be combined.

Senator O'MAHONEY. This is on a laboratory basis?

Lieutenant Colonel BROWN. It is on a laboratory basis; yes, sir.

Senator O'MAHONEY. Have you produced or have any of these laboratories, the private laboratories, produced another type of nylon?

Lieutenant Colonel BROWN. The type that we are investigating right now is a substitute for the one we are using. I believe that has been brought out by the people who developed nylon originally, the duPont Co., I believe.

Senator O'MAHONEY. And what about the substitutes for leather?

Lieutenant Colonel BROWN. I believe we had better ask the Quartermaster man about that, sir.

Mr. MOCKABEE. We have had several programs under way in that field, and, Mr. Chairman, one is on the substitute materials for tanning and stuffing of leather. We have developed a tanning material for sole leather that is quite effective, and which is in its final stages of development. We have some of it in production to a limited degree.

Senator FERGUSON. Does that make the leather wear longer?

Mr. MOCKABEE. No; the tanning agents are imported materials. The one for the upper leather is a resinous material that is now under development. It has not yet reached the production stage.

Senator O'MAHONEY. If we are dependent on imported materials, then we are at a disadvantage.

Mr. MOCKABEE. That is what we are trying to get away from.

Senator O'MAHONEY. And you are trying to develop a substitute for the imported materials?

Mr. MOCKABEE. That is right.

Senator O'MAHONEY. What you have said to date deals only with substitutes for materials that are used in tanning leather, and not with a substitute for leather itself.

Mr. MOCKABEE. Now, as to the substitutes for leather, we are developing, for example, a substitute for sole leather. It isn't leather; it is a composition material for both the outsole and the insole.

Senator THYE. Does it improve the wearing quality, the resistance to moisture and so forth, of the leather soles?

Mr. MOCKABEE. Yes. In that area we are also developing water-resistant compound treatment for leather.

Senator O'MAHONEY. Now, what about wool?

Mr. MOCKABEE. In the case of wool we are trying to find ways and means of stretching our domestic supply of wool.

Senator O'MAHONEY. Certainly you are not seeking a substitute; you are seeking what is called an extender?

Mr. MOCKABEE. That is right. The sheep has done a pretty good job. There is very little we can do to improve upon natural wool.

Senator O'MAHONEY. Nothing has been discovered as yet that will improve on it?

Mr. MOCKABEE. That is right, sir, but through blends with other synthetic fibers, we can stretch our supply of wool to the utmost.

Senator O'MAHONEY. Well, we could use that, perhaps, for socks or for shirts or for tropical uniforms.

Mr. MOCKABEE. Another way of stretching our supply of wool is through developing methods of shrink-proofing to make the products wear longer.

Senator O'MAHONEY. You have not developed any synthetic that could be extended to a uniform which could be used with the food kit which you showed us this morning?

Mr. MOCKABEE. No; but in that area there is one development you would be interested in. We have developed a new type of insulation for the Arctic uniform using mohair which is in plentiful supply, and which the Armed Forces have had very little use for in the past. The only use, to my knowledge, is in neckties, where we use mohair today. It is a very effective insulation, and it wears very, very well.

Senator O'MAHONEY. In what form is this mohair used?

Mr. MOCKABEE. In the form of insulation. It takes the shape of a double frieze, similar to what you see on furniture. It is that type of thing.

Senator O'MAHONEY. Do you make that in the form of a shirt or a vest? In just what form is is used?

Mr. MOCKABEE. It is an insulating material that goes on the inside of the garment.

Senator O'MAHONEY. That would be a lining for a coat, for example?

Mr. MOCKABEE. That is right, sir. So we are extending our wool supply, you might say, using this mohair as a replacement for wool.

Senator O'MAHONEY. Mohair is a natural product, is it not?

Mr. MOCKABEE. That is right.

RESEARCH IN SYNTHETICS

Senator O'MAHONEY. It is not a synthetic by any means?

Mr. MOCKABEE. That is right. That is another field in which we are trying to extend.

Senator O'MAHONEY. How far have you gone with the tests for woolen extenders?

Mr. MOCKABEE. In the field of fiber glass we haven't made the progress that we would like to. You have there lightness of weight, it doesn't absorb moisture, it provides a high degree of insulation. But the glass fiber does cut itself, so that at points of stress, such as at the elbows and the knees, it does break down. So we have been stopped, you might say, in that approach, until we can find a fiber that has the desired resiliency and will not cut itself. The fiber glass has not progressed as a clothing insulation as we would like to see it.

Senator O'MAHONEY. With respect to the synthetic extenders, what have you done, and how are you pursuing that research?

Mr. MOCKABEE. I will have to answer that in terms of areas, Mr. Chairman. Shrink resistance has been extended to most all of our woolen items now, and is now going into blankets. It has covered shirts, socks, trousers, right straight across the board. That program has progressed very well.

Senator O'MAHONEY. How do you obtain the shrink resistance?

Mr. MOCKABEE. It is a treatment, sir, a chemical treatment of the wool.

Senator O'MAHONEY. That is not a synthetic fiber?

Mr. MOCKABEE. No, sir; but it is an area of extending the wool supply.

Senator O'MAHONEY. Yes.

Mr. MOCKABEE. The synthetic fibers have been utilized, for example, in socks and in wool bunting for flags. There we get at least three times the wear that you would get from a normal wool bunting.

We, ourselves, have not developed any synthetic fibers. Those have been developed by industry. Our work in that area is largely one of evaluation and application.

Senator O'MAHONEY. Where is that done?

Mr. MOCKABEE. Principally in the laboratories of the Philadelphia Quartermaster Depot.

General MARIS. And in your field testing in Alaska and in Canada.

Mr. MOCKABEE. They are all field tested in Alaska.

Senator O'MAHONEY. We will sometime have to visit these installations.

Senator FERGUSON. That is about the only way you can visualize them.

General SIMON. In connection with synthetic rubber, we are using the basic principles of the Quartermaster, the basic work in rubber, and we have developed tires for the smaller types of vehicles which are 98 percent synthetic rubber and are now satisfactory. Up to around the size of a tire for the 2½-ton truck we have an 85-percent synthetic tire. In the very large-sized tires we are finding that we can't work as much synthetic rubber into them, but we are pressing research to put more and more synthetic rubber into the tires of the fleet because we may have our supplies of raw rubber cut off during wartime.

Senator O'MAHONEY. Mr. Mockabee, if you have that device that you brought in this morning, I would like to have Senator Ferguson see it.

Mr. MOCKABEE. This is a device for the dropping of gasoline that has been used successfully in dropping 5-gallon quantities of gasoline and at 2,000-foot altitudes.

Senator O'MAHONEY. It bounces.

Senator FERGUSON. It is better than the old tank?

Mr. MOCKABEE. Yes, sir; very much better.

Senator FERGUSON. What does the gasoline do to that rubber?

Senator O'MAHONEY. That is rubber and nylon.

Mr. MOCKABEE. Yes; it is a synthetic developed in the synthetic-rubber program. We haven't progressed as rapidly in developing low resistant oil-resistant compounds as we would like to.

Senator FERGUSON. They are supposed to empty these within a reasonable time; is that it?

Mr. MOCKABEE. Yes.

Senator FERGUSON. Will it hold up for quite a while?

Mr. MOCKABEE. Yes, sir. These can be used over again.

Senator O'MAHONEY. How about these steel alloys, suitable substitutes for steel alloys?

General SIMON. That is a very tough field, sir, in which we are doing everything we can, because we always run short of alloys for steel.

In World War II, for example, we had to keep cutting back on alloy. Alloy, after all, is a way of getting the quenching through the metal. If you can quench enough, you can get the physical characteristics without so much alloy.

I remember that our Advisory Group at Watertown Arsenal finally said that if we just didn't run out of water we would still make good armor plate. That meant that they had succeeded in quenching homogeneous armor plate sufficiently well to keep its physicals with the reduction of alloys.

Now, the alloys that are hurting ordnance today are chrome, molybdenum, nickel, and tungsten. In the field of tungsten, which is really the most critical alloy, I would like to say this off the record.

(There was a discussion off the record.)

Senator O'MAHONEY. On the record.

APPROVAL OF RESEARCH PROJECTS BY RESEARCH AND DEVELOPMENT BOARD

It is my understanding that no research is undertaken for any of the armed services, until it has cleared this central board?

General SIMON. That is correct. It has to be cleared really by three hurdles, Mr. Chairman. It has to be cleared by the committee headed by General Maris, the Army Research and Development Budget Review Board, which has representatives of the Secretary of the Army and the Army Field Forces. Then it has to be cleared by the Research and Development Budget. Then, of course, these things come up to the Congress.

Senator O'MAHONEY. Each of the armed services has its counterpart of the group that General Maris heads in the Army?

General MARIS. Yes, sir.

Senator O'MAHONEY. So that in the last analysis you have the General Staff and this Research and Development Board which tries to coordinate the whole thing?

General SIMON. Yes, sir.

BUDGET SITUATION

Senator O'MAHONEY. Now, General Maris, how does the budget which you have been defending here so very lucidly this afternoon and with such great interest to the members of the committee, compare with the budget which you prepared when you were called upon at the beginning of the year?

General MARIS. It was reduced by $102,000,000. It was cut back that amount.

Senator FERGUSON. Now, are you going to come in for that on deficiencies?

General MARIS. No, sir; that was cut back by the Research and Development Board.

Senator FERGUSON. We get notice that you fellows are coming up again for deficiencies and supplementals.

General MARIS. This is our program for the year, unless there is some urgent need which results from a full national emergency.

Senator FERGUSON. Then you don't know of any deficiency?

General MARIS. No, sir; however, there are always new requirements coming up. In that connection, the Research and Development Board recommended to the Secretary of Defense that a reserve fund be set aside for such things as are not foreseen, and for new programs that might be required. In such cases, we go to them and put in our plea for an additional amount.

Senator FERGUSON. How much of this budget is to be set aside?

General MARIS. None. This budget goes to the various respective development agencies.

Senator O'MAHONEY. How much do you think we can safely cut out of this now so as to maintain a pay-as-you-go program?

General MARIS. We feel, sir, that this has been reduced now to the minimum, considering the situation at large.

Senator O'MAHONEY. Is this then an austerity base?

General MARIS. If we were on a strictly peacetime basis, Senator, that would be another story; but with the strategic requirements facing us, this is the minimum budget required for this purpose.

Senator FERGUSON. We are looking for somebody who will actually say "Well, now, I think you can take a little off this, and we will be able to get along."

General SIMON. It will cost you money if you do that, sir.

Senator FERGUSON. That is the same answer we get from all of them. There must have been research on that.

General SIMON. A large part of our research and development is directed toward reducing the cost of the end item that is to be produced in quantity. For example, in connection with this ammunition here, in 6 months of research and development the design was accepted as satisfactory, and then we set about reducing that cost. We cut the thing down to about one-third what it was going to cost, through mass production. A large part of our research and development work is directed toward producing these things cheaper.

Senator FERGUSON. Will you tell us with respect to what other items you are going to cut the cost down to one-third, so that we can take the other two-thirds away? That is the thing we are looking for We haven't found any place where we can cut in production.

General SIMON. What we want to do is to cut the cost of production so that the replacement items that we are providing for the new programs of the Army will be chaper.

Now, we are doing this for economy—in fact, we have posters in every one of our research and development agencies, carrying a big motto on the wall which reads: "Ordnance design objectives: Effectiveness, ruggedness, simplicity, economy."

Senator THYE. General, this will require the retooling of some plants, will it not?

General SIMON. Well, the retooling will be required for the new item anyway. That is, when we make a new item of ammunition and have succeeded in making it work, the next thing we do is to try to succeed in making it just as cheap as we can make it.

Senator THYE. However, when you have done the research, and have put the new ammunition into production, that does replace the equipment or the ammunition you had been manufacturing?

General SIMON. In some instances, yes, sir.

Senator THYE. Therefore you must retool?

General SIMON. That is right. In the case that I pointed out off the record, I would like to say further off the record——

(Discussion off the record.)

Senator THYE. The retooling is a considerable expense?

General SIMON. That is true, and it would not be worth while unless you were going to manufacture it in quantity. Then the saving will be very large.

Senator THYE. That is one of the items of expense that you are now faced with. That is, as you proceed with this new production there must be a plan for retooling, and there is that expense involved.

General SIMON. I would say that what we would save on one species of ammunition alone would probably pay for our research and development program.

Senator THYE. Including the retooling?

General SIMON. Yes, sir. I think that cost on ammunition will pay for the whole research and development program, that is, what we will save.

Senator O'MAHONEY. Have you described these tanks that you have here?

General MARIS. We did not go into them in detail, because I was afraid it was getting a bit late. However, the other people who were waiting to testify have gone now.

In connection with the tank program do you desire details on that?

Senator O'MAHONEY. One or two, yes.

General MARIS. Colonel Thorlin will speak on that.

STATEMENT OF COL. JOHN F. THORLIN, CHIEF, TANK AUTOMOTIVE DIVISION, OFFICE OF CHIEF OF ORDNANCE

RESEARCH AND DEVELOPMENT ON TANK AUTOMOTIVE ITEMS

Colonel THORLIN. After World War II, our funds for research and development on tank automotive items were approximately $5 million a year. Now, that was for approximately 80 different types of vehicles, including tanks, trucks, tractors, trailers, self-propelled artillery, and a lot of variations. With $5,000,000 a year we could have come out with half a dozen new pilot vehicles each year. But the sane and sober way to do the job, we felt, was to spend that money on the development of components. After all, a tank or any vehicle is simply an aggregate of components, such as an engine, a transmission, a frame, a suspension tracks, wheels, tires, and so forth. If we have small components which are reliable and which are powerful, then we can assemble them together and come out with a superior vehicle.

The British, for example, came over here last spring, and they wanted to find out how we could make our tanks lighter than theirs. They carry a 90-millimeter gun on their tanks, and it weighs 55 tons. We carry the same gun and the same amount of ammunition and the tank weighs, we will say, 15 tons and less. The reason for that lead is the fact that we have developed small components, smaller in both size and weight.

The transmission, for example, is smaller, and therefore we don't have to encase it with a long length of armor plate.

So, until 1950, we spent our time on components, and we feel that it has paid dividends.

In 1950, we immediately said: "This is the time to cash in on the component development" and we went into the design of complete vehicles.

NUMBER OF RESEARCH PROJECTS

We have, counting all of our tank automotive projects, roughly, 25—I counted them here a few minutes ago—25 vehicles which are now going into production, 25 different types of vehicles.

Senator O'MAHONEY. Is it necessary to have as many as 25 different vehicles?

Colonel THORLIN. Unfortunately, it is, Senator.

Senator O'MAHONEY. Is that an absolute fact?

Colonel THORLIN. Let me tell you what the 25 vehicles are: For example, we have the 105 howitzer self-propelled vehicle. There is one model on the table. Then we have a 155-millimeter gun vehicle, and an 8-inch artillery gun vehicle. We have 40-millimeter, twin antiaircraft, self-propelled vehicles. We have light, medium, and heavy gun tanks. We have tractors of various types—light, medium, and heavy. We have ¾-ton trucks, 2½-ton trucks, 5-ton trucks, and we have amphibious vehicles, amphibious tractors, ducks, and so forth.

Senator FERGUSON. Why do you have to have a different base for this tank than you do for the other one?

Colonel THORLIN. We don't. In that particular case; that is the same base. That is one of the fruits of working, as I said, on components.

Senator O'MAHONEY. It does not look like the same base.

Senator FERGUSON. Certainly to a layman it does not.

General SIMON. The 155-millimeter gun vehicle is made on the base of the light-gun tank, and this one right here is the medium-gun tank. There are three weights of tanks, the light-gun, the medium and the heavy. In this interchange of components, you see, the vehicle you have directly in front of you has the base that goes with the light-gun tank, not the medium-gun tank.

Senator THYE. They are the same track, only a lesser length of track. Do you use the same track?

General SIMON. I believe there is one less bogey wheel.

Colonel THORLIN. There is one less bogey wheel but substantially that is true.

Senator THYE. What I mean is: Are they interchangeable? Are the little idler wheels on the side that give you nothing but support for the bottom of your track, are those interchangeable in the tanks, so that you don't have to carry a big inventory?

General SIMON. The components are about 90 percent interchangeable.

Senator THYE. The only difference is in the length of the track and the number of idler wheels that you have in there, but otherwise your inventory would be the same stock, so that when you came to make repairs and replacements, they would be interchangeable?

Colonel THORLIN. That is correct, sir.

Senator O'MAHONEY. You say this is a medium tank and that this is a heavy one?

General SIMON. No, sir. That is a 105-millimeter gun vehicle that is mounted on the light gun tank chassis.

Colonel THORLIN. That is not a tank. That is called a self-propelled artillery vehicle.

Senator O'MAHONEY. I am trying to understand the difference now. This is a medium base and this is a light-tank base. Now, there is a heavy-tank base, is there not?

Colonel THORLIN. Yes, sir.

Senator O'MAHONEY. Is that used interchangeably with guns?

Colonel THORLIN. Yes, sir. It is used for heavy tractors, for example. We use it also for a heavy self-propelled artillery base.

MEDIUM TANK BASE

Senator O'MAHONEY. Now, for how many items can you use this base?

Colonel THORLIN. How many vehicles do we use that base for?

Senator O'MAHONEY. Yes.

Colonel THORLIN. The medium tank base is used in the medium tractor, M–8, for example. It is used also in the 155-millimeter gun, self-propelled vehicle. It is also used in the 8-inch howitzer, self-propelled.

Senator O'MAHONEY. Let me ask it this way: How many different bases do you have?

Colonel THORLIN. There are three primary different bases.

Senator O'MAHONEY. Three primary different bases?

General SIMON. The light, medium, and heavy, sir.

Senator O'MAHONEY. And those are interchangeable among various types of vehicles?

General MARIS. There is a family for each size of base. That is part of the standardization program.

Senator O'MAHONEY. And you need the three different sizes?

General MARIS. Yes, sir.

Senator O'MAHONEY. That is the best judgment of your organization?

General MARIS. Yes, sir.

STANDARDIZATION OF ENGINES

General SIMON. I might point out how this pays off, Mr. Chairman. In World War II we had 105 engines. We now have 20 engines. That is for all types of vehicles, everything from jeeps all the way through to the heavy tanks. We have had six engines for the medium tank alone in World War II. Now we have one engine that serves five vehicles.

Senator O'MAHONEY. So you have been trying to reduce the number of items going into all these vehicles?

General SIMON. That is right, sir. In addition, I might say that those 20 engines are highly interchangeable within their parts, that is, 1 engine will have 12 cylinders and another 1 will have 6 cylinders, but the cylinders are all interchangeable, and the pistons are all interchangeable, for example.

Senator O'MAHONEY. Among all types?

General SIMON. Not all types, but as nearly as we can within families. You can't have all the pistons the same size.

Senator O'MAHONEY. I see.

General SIMON. But that does enormously cut down the number of parts needed in the pipeline and in the supply line and on the number of parts you have to keep in stock.

Senator FERGUSON. Now, you have one line running in the Detroit Arsenal?

General SIMON. That is right, sir.

Senator FERGUSON. You have one shift?

General SIMON. That is right.

Senator FERGUSON. There are two lines, and you could run two shifts. Why are you only running one?

General SIMON. The answer to that, sir, is not a research and development program matter. I would say that it was an over-all policy question, but I don't believe that anyone has any reluctance about revealing that.

I will say that off the record, sir.

(There was a statement off the record.)

RESEARCH FOR ECONOMY IN BUDGET

Senator FERGUSON. How much are you spending on research for economy, compared to your other research?

General MARIS. That enters into the research and development of all of the items as we go along.

Senator FERGUSON. How many men have you assigned to really research in economy?

General SIMON. They are the same people that do the research, to begin with.

Senator FERGUSON. That is what is wrong with it.

General SIMON. The first thing that we do is to get a new thing to work. When we get it to work, then we start finding out how to produce it most cheaply. That is what we more or less call applied research.

Senator FERGUSON. How many people do you have in your department?

General SIMON. You mean every one of them that works on the economy phase?

Senator FERGUSON. Yes; how many do you have?

General SIMON. You mean the total number of people?

Senator FERGUSON. Yes.

General SIMON. There are between 6,000 and 7,000, counting all of the laboratories in all of the places.

Senator FERGUSON. Now, have you any division that is set up to go over the various things and see how you might economize?

General SIMON. Every division must do that. Once a new thing is developed, work is begun on making it cheaper. Every division must work on economy.

General MARIS. Then as I mentioned awhile ago, we have our Operations and Research Office. The primary job of that Office, the ORO, is to study these weapons' systems and to determine whether they are worth while, or what economy measures can be introduced there. That is one of the objects of that particular group.

General SIMON. There is an extremely strong reason for that, Senator.

We know from past experience, going back to World War II, that all of our stuff costs us about a dollar a pound. It is costing a whole lot more than that today. The weight is proportional to the money, and the money is proportional to the national effort, and national effort is never scarcer than in time of war. So if we can buy a certain number of tanks for, let us say, a quarter of a million dollars apiece, we are going to get probably twice that many if we can build them for an eighth of a million dollars apiece.

Senator FERGUSON. But here is our trouble. We find that the cost of this tank has gone up enormously.

General SIMON. That is right.

Senator FERGUSON. Will you give us the figures from year to year, of the cost of a tank, for instance, at the Detroit Arsenal?

Senator O'MAHONEY. We will get that from Ordnance when they come before us.

General SIMON. You cannot get that on a very comparable basis, sir, because, you see, at the time of World War II we made over 80,000 tanks, and we had much better quantity production. We don't have quantity production today. We only have semiquantity production.

Senator FERGUSON. The question is whether or not we could get some economy by not building so many tank plants. You are putting up three others, and you are only going to run this one for one shift, and therefore you are saying that it is costing much more money to make a tank in the Detroit Arsenal.

General SIMON. But they are different kinds, sir. The Detroit Arsenal is set up for the medium tank, and the other arsenals are set up for the light tank.

Senator THYE. You are preparing yourselves now much on the basis as if you were marking time, but you are prepared to go into full production if the emergency becomes such that you must have a replacement of hundreds of tanks knocked out daily?

General SIMON. That is correct.

Senator THYE. So, what you are doing today is perfecting what you have, getting the plants constructed and the tools into them to do the job with, and then you are marking time, so to speak, for any flare-up that may occur somewhere in the world, and which would be world-wide, and which will demand a much higher production than just what the one plant can produce if you only have the one plant.

General SIMON. That is a very good analysis, sir.

General Ford's Industrial Division studies each kind of production line and has established what it calls a minimum rate of economical production. They try to run it and not go below this minimum rate of economical production where the cost begins to go up very steeply.

Senator THYE. If you had only the plant capacity to meet the emergency in Korea, and if you had an emergency occur someplace else in the world, which tripled the Korean situation, then you would have to take the necessary time to build the necessary plants, in order to get the production to meet that increased emergency?

General SIMON. There would be a full 2-year lead time, I would say.

Senator THYE. What you are doing here today is that you are perfecting, not only the process of manufacture, but you are getting first the plants and then the tools into those plants to meet any crises that are now unforeseen.

General SIMON. That is correct, sir. You will have that made very clear when the Ordnance budget comes up.

Senator O'MAHONEY. Yes, sir; we will go into that at that time.

RECOMMENDATIONS FOR PRACTICAL MANUFACTURE OF EQUIPMENT

General MARIS. I would like to make one statement in connection with that subject.

This is the recommendation of the Army field forces, the using arm, which was approved and adopted by the Chief of Staff.

Provided no reduction results in essential military performance characteristics, greater economies in the production of equipment will be achieved through the acceptance of:

Less finely tooled and surface-finished items.

Elimination of nonessential luxury accessories and sales dressings.

Modifications which facilitate production.

Changes of design of standard equipment shall be made only when required for performance of combat missions, or when such action will simplify design, facilitate production, provide marked improvement in performance, or result in over-all economy.

Senator O'MAHONEY. General Maris, does the budget officer, the military budget officer, exercise any restraint on you?

General MARIS. Yes, sir.

General SIMON. I would say that I see a good deal of the correspondence of the Chief of Ordnance with the Detroit Arsenal, and the subject matter of about half of that correspondence is economy.

Senator O'MAHONEY. Off the record.

(Discussion off the record.)

Senator O'MAHONEY. Now, on the record.

General Maris and all of your associates, I want to thank you for a most interesting afternoon. You have kept us here longer than we expected to be here, but you have yourselves only to blame for the time that has been spent here. I thank you very much.

General MARIS. Thank you, sir.

Senator O'MAHONEY. The committee will stand in recess until 10 o'clock tomorrow morning.

(Whereupon, at 5:20 p. m., Wednesday, August 1, 1951, the hearing was recessed until 10 a. m., Thursday, August 2, 1951.)